13(4)

Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

U. S. F. W. S.

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical	3 Preserved fish	7 Analytical Methods
1 Fish by species	4 Oils	8 Composition
2 Fresh fish	5 Vitamins	9 Miscellaneous
	6 Fishery byproducts	

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

2.00 PRESERVATION OF FRESH FISH

Tarr, H. L. A. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Archiv fur Fischereiwissenschaft 8, 9-21 (1957)
Studies 1958, from the Stations of the Fisheries Research Board of Canada, FRB 524 (1959) (Ottawa)

Introduction. -- The author, using 77 references, discusses the subject of spoilage in fresh fish. Particular emphasis is placed on the comparative value of various methods whereby spoilage may be delayed.

Physical conditions. -- The early work of Hess and Huntsman in Canada, about 1928, showed that the rate of bacterial spoilage of fish was about twice as rapid at 2.5° C. as at -1° C. This discovery paved the way for subsequent attempts to devise practical methods for storing fish at -1° C. without surface drying when the atmosphere is not saturated with respect to water vapor. To avoid surface-drying, methods of storing fish at about -1° C. have either employed ices or dilute solutions containing various solutes that lower the freezing point. One of the greatest values of ice lies in its ability to bathe surfaces of fish with a slow stream of clean water and thus help to remove bacteria and their products of metabolism.

Lowering temperatures by use of special ices. -- Ice-making techniques that involve rapid freezing of water in comparatively thin flakes permit the preparation of sea-water ice. Hansen has shown that ices containing 1 percent and 3 percent of sea salt are slightly more effective than fresh-water ice in preserving iced cod.

Refrigerated sea water. -- In 1947, refrigerated sea water was tried in Canada for use on trolling boats. Because the results obtained were very promising, the work was expanded to a salmon-packing vessel capable of holding 40,000 pounds of fresh salmon and to a 75-foot halibut vessel. By using this

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 ABSTRACTER: Martin Heerdt

2.1121 NEW TYPE ONE-BOAT MID-WATER TRAWL GEAR

Anonymous
Fisheries Newsletter (Australia) 18, 23 (November 1959)

Promising catches of herring and sprat have been made with a new type of one-boat midwater trawl gear, consisting of a high-opening nylon net, hydrofoil otter boards, and an echo-sounder oscillator attached to the headline of the net. The echo-sounder oscillator provides a continuous indication of the depth of the trawl and signals the presence of fish.

The method described here was developed by Dr. J. Scharfe, FAO, Fisheries Division gear technologist, while he was working in Hamburg, Germany, at the Institut fur Netzund Materialforschung.

The basic idea of Dr. Scharfe's method is not new. It consists of attaching an oscillator (transducer) to the net and connecting it by cable to the echo-sounding unit installed on board. An echo-sounder oscillator attached to the bosom part of the headline to sound downwards gives indications not only of the depth of the net, but also of the position of the foot rope and of the fish in the net opening and below the net, as well as the position of the sea bottom.

This information enables the fisherman to know the depth of the net, check on the operation of the gear, and to note if the fish in the path of the net are being caught. With experience, the fisherman may be able to estimate the rate of catch and thus determine the right time for hauling.

The experimental net had an opening height of 26 feet to 32½ feet and, to improve its maneuverability, hydrofoil otter boards, designed by F. Suberkrub, of Hamburg, were used. These provide a good sheer at a considerably lower drag compared with the conventional boards. The warp is

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 ABSTRACTER: Kathryn L. Osterhaug

2.03 DISTRIBUTION OF A LIPASE ENZYME IN LINGCOD FILLETS AND THE EFFECT OF LOW TEMPERATURE STORAGE ON ITS ACTIVITY

Wood, J. D. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Journal of the Fisheries Research Board of Canada 16, 755-757 (October 1959)

Introduction. -- Fish fillets deteriorate gradually even when stored in the frozen state at temperatures as low as -20° C. One type of reaction that occurs in fillets at these temperatures is the formation of free fatty acids. Dyer and his coworkers (1956 and 1959) have studied the formation of free fatty acids in various species of fish held at different storage temperatures. Although the formation of free fatty acids has been observed for several years, the mechanism of the acid-forming reactions has not been explained. Fatty acids may arise from the hydrolysis of triglycerides or from the breakdown of phospholipids. These reactions can be brought about by enzymic action in the fish flesh, by bacterial action, or by nonenzymic catalysis within the fish muscle.

Purpose. -- Lingcod muscle was analyzed for the presence of fat-hydrolizing enzymes. Lipase, an enzyme capable of splitting off fatty acids from triglycerides, was found by Wood (1959). Further studies (1) on the distribution of this lipase in lingcod fillets and (2) on the effect of storage on the activity of this enzyme are reported in this paper.

Experimental. -- Fresh lingcod were filleted and skinned, and each fillet was cut into sections that were numbered consecutively beginning at the tail end of the fish. The fillet sections were glazed, wrapped individually in polyethylene bags, and stored at -20° C. To isolate lipase activity, the frozen fillet sections were chopped into small pieces and homogenized for 45 seconds in three volumes of ice-cold distilled water. The resulting homogenate was centrifuged at 20,000 times gravity for 20 minutes; a supernatant liquid was decanted from the centrifugate, filtered through glass

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 ABSTRACTER: Martin Heerdt

2.113 STUDYING FOULING ORGANISMS

Willings, Lucy M. (C.S.I.R.O., Division of Fisheries and Oceanography)
Fisheries Newsletter (Australia) 18, 23 (October 1959)

Ship owners know well the problems caused by marine fouling organisms, whose quickly growing bulk increases the friction of a ship moving through the water, decreases its speed, but increases its fuel consumption. Whether the ship is the Queen Mary or the smallest freighter, it has to be slipped at regular intervals so that the plant and animal growth can be scraped from the hull. The study of borers in wooden hulls is quite a separate question from the fouling work described and is not included in the research programme discussed here.

The average observer can scarcely believe the biologists' assurance that a great deal of this growth is animal, nor can he imagine how the growth starts. Officers of the C.S.I.R.O. Division of Fisheries and Oceanography have co-operated for some years with the Royal Australian Navy in a study of the fouling organisms on ships. At first, surveys were made to determine which animals would settle on test plates exposed in many ports on the east coast of Australia. From the collections taken from the plates the distribution and seasonal intensity of the settling were determined for the more important of the animals responsible for fouling.

Six or eight of the most serious fouling organisms in Sydney Harbour are barnacles, tubeworms, bryozoans, and mussels. In the adult stage these animals are fixed and incapable of any movement, but they all have free-swimming young stages or larvae. After periods varying from 2 to 3 hours to several weeks of swimming freely, the larvae settle on suitable surfaces.

The examination of this settling stage is now the main part of the present research programme

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PRESERVATION OF FRESH FISH

LIPASE ENZYME DISTRIBUTION IN LINGCOD FILLETS

MIDWATER TRAWL GEAR

FOULING ORGANISMS

2.03 (Cross Reference: 4.4)

wool, and measured immediately for lipase activity. This activity was measured by the monometric determination of carbon dioxide evolved from a bicarbonate buffer as a result of the liberation of fatty acids by the enzyme. The experimental conditions employed in this study were the same as those described previously by Wood (1959). Protein estimations were made by using the method of Kingsley (1939) as modified by Snow (1950).

Results.--The lipase activity of the preparations obtained from the different sections of fillet increased progressively from the tail section to the head section. The amount of protein extracted from the flesh showed the same trend, but the percentage increase in protein nitrogen was much less than the percentage increase in enzyme activity. Since the lipase is not uniformly distributed throughout the flesh, care must be taken during comparative studies to obtain a sample that represents the fillet as a whole. This difficulty was avoided in fillets that had been held in storage by taking the average of three values obtained from tail, middle, and head sections of the fillet, respectively, as the value for the whole fillet.

Lingocd fillets, after storage at -20° C. for various lengths of time, showed only a gradual and rather ill-defined decrease in lipase activity. After storage of the fillets for 12 weeks at -20° C., the lipase was still very active. According to this study, the enzyme that is responsible for the formation of free fatty acids is stable in lingcod fillets held at -20° C.

Discussion.--The studies reported here give further evidence that the lipase enzyme found in lingcod muscle could be responsible for the formation of free fatty acids in frozen fillets because it has the necessary properties; the evidence, however, is by no means conclusive. Since the phospholipids make up a major portion of the muscle fat in several species of fish, phospholipase also may play a major role in free fatty acid formation. The possibility of a phospholipase in lingcod muscle is now being investigated.

2.00 (Cross Reference: 3.10)

technique, the labor of icing fish is dispensed with, and the eviscerated fish are merely thrown into the tanks of sea water previously chilled to -1° C. where they cool quite rapidly. Uneviscerated fish may be held for several days in this medium under certain conditions, provided they have not fed recently so that the activity of their visceral tract is at a low level.

Effect of storage in refrigerated sea water on fish.--Fish stored in refrigerated sea water invariably increase slightly in weight. The increase varies with time of storage, size, and fattiness of fish and whether or not the fish are eviscerated. Thin fish such as small sole may increase as much as 18 to 20 percent in weight. Studies have shown that protein losses, with salmon at least, are somewhat less in salmon stored in refrigerated sea water than with those stored in ice. Since three to four times as much fish as sea water can be stored in tanks in the hold of a vessel, this method appears to offer significant possibilities as a practical medium for holding chilled fish.

Chemical preservation.--In 1952, the author found that 0.5 to 1.0 parts per million of chlortetracycline inhibited the bacterial spoilage of fish. Flake ices containing 1, 2, and 4 parts per million of chlortetracycline appeared to be about equally effective in delaying bacterial spoilage when used to ice lingcod. Bacteriological and organoleptical examination indicated that coho salmon (Oncorhynchus kisutch) in chlortetracycline ice kept at least 5 days longer than salmon stored in ordinary ice. Shewan, of the Torry Research Station, reported that with ice containing 5 parts per million of chlortetracycline the point of inedibility in cod and haddock was reached some 7 to 10 days after it was reached in the controls held in ordinary ice.

Antibiotic residues in fish flesh and public health aspects.--In uncooked fish that had been held in ices containing between 2 and 4 parts per million of chlortetracycline, the highest residue found was 0.6 parts per million in an unskinned fillet. Residues in the cooked flesh varied with the method of cooking and with the area sampled, and amounts of 0 to 0.3 parts per million were found. Chlortetracycline residues in whole eviscerated fish stored in refrigerated sea water, or dipped in chlortetracycline solutions, were somewhat higher than those found in iced fish.

2.113

which is under the direction of Mr. B. Wisely. For this, supplies of the larvae of the important fouling organisms must be secured, and those that have a long free-swimming period must be kept in aquarium tanks and fed until they are ready to settle.

Of the most serious fouling organisms one is the copper-resistant bryozoan Watersipora cucullata Busk, whose young stages settle in a few hours after they have been liberated from the parent. Another is the tubeworm Hydroides norvegica, Gunnerus, whose larvae do not settle for 8 to 10 days and have to be fed in the aquarium. The larvae are minute, just visible to the naked eye, and they feed on smaller microscopic organisms, diatoms, dinoflagellates, and algae, which have to be produced in enormous numbers during laboratory rearing.

The C.S.I.R.O. laboratory now has 11 food organisms in cultures, one of which has been grown in the apparatus shown in Figure 1. This apparatus produces mass cultures used to feed large aquarium populations of barnacle, tubeworm, and mollusc larvae to the settling stage.

Now that some of the difficulties of rearing larvae in the laboratory have been overcome, experiments are being planned to test the effect on settling larvae of certain toxins, some of which have been used in anti-fouling paints. When this information has been collected, it will be used as a guide by chemists of the RAN, who are concerned with the incorporation of toxins into anti-fouling paints.

The most effective toxins to be used, their leaching out rates, and the method of application of these paints are all important aspects of this research and the chemist spends a long time testing the efficacy of his paint samples. This time can now be considerably reduced, because the biologist in his laboratory work can indicate the toxins most lethal to the larval stages of the important fouling organisms, and the concentrations of these toxins which must be maintained on a ship's hull to prevent these larvae settling successfully.

2.1121

attached above the center of the board which gives an inward tilt, the lift varying with the towing speed. This arrangement increases considerably the influence of speed variations on the depth of the net, and enables the skipper to regulate the depth through engine control.

This new gear combination enables the skipper to practice "aimed" fishing in what has hitherto been mostly a blind operation.

The skipper of the cutter chartered for the experiments was soon able to handle the gear and, since the experiments, has successfully fished with it on a commercial scale. He has often caught as much fish as, or even more than, pair-trawl boats fishing nearby.

An interesting innovation was tested during these trials: an oscillator on the trawl headline, transmitting concurrently up to the surface and down to the bottom. This gives the skipper much better information on the actual trawl depth than he could get by conventional operation. Irregularities of the bottom profile may be mistaken for net movements, and vice versa, but the indication of the trawl's distance from the surface eliminates this difficulty completely.

2.1122 A SIMPLE RIG FOR MULTIPLE TROLLING WITH REELS AND WIRE LINES

King-Webster, W. A..
World Fishing 8, 25, 26, 60 (November 1959)

The commercial fisheries of the island of Trinidad depend mainly on surface-living fishes of moderate size. The established method of trolling for them is to use three handlines of single-strand bronze wire: one over the stern, and one on each side of the boat from a pair of bamboo outriggers. This type of rig is inexpensive and simple. Its disadvantage is that when a fish is hooked the line must be brought into the boat in loose, springy coils that spread over everything. Three lines, therefore, are the most that can conveniently be fished at one time. Also, much time is lost in getting the lines out again after fish have been caught.

These difficulties could be overcome if reels could be successfully used for bringing in the wire when a fish is caught. A very simple rig with a reel was devised and tried on the fisheries launch of the Trinidad Department of Fisheries. Figure 1 (see over) indicates the general appearance of these rigs.

When a number of lines are being trolled from one outrigger, each line should be longer than the one inside it and less heavily leaded. The line next to the boat is the shortest and most heavily leaded. This allows the outer line to be brought in over the inner lines. See drawing (over).

Comparative trials of this gear against the established method are not yet complete, but it already is clear that reels greatly facilitate the hauling and letting out of lines.

See illustrations, over.

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 ABSTRACTER: Kathryn L. Osterhaug

2.116 ECHO RANGING FOR NORWEGIAN HERRING

Gerhardsen, Torvald S.
World Fishing 8, 20-22 (November 1959)

In February 1946, a Norwegian naval vessel equipped with sonar (asdic) was put at the disposal of the Institute of Marine Research, Bergen, Norway. This provided the opportunity for the first systematic investigation of the suitability of sonar equipment for detecting shoals of herring.

The basic principles of echo ranging are described as follows:

A "searchlight" as opposed to a "scanning" sonar set employs a directional transducer to transmit and receive sound waves. The echoes are amplified and presented on a graphical recorder and reproduced through a loudspeaker and headphones. They are also recorded on a moving strip of sensitive paper by a motor-driven stylus travelling at uniform speed across the paper along a calibrated range (or depth) scale.

When lowered to its working position, the sonar transducer may be trained to any desired bearing in accordance with the desired search program. Briefly, the sequence of events is as follows:

A pulse of sound energy is emitted each time the stylus passes the zero mark on the range scale. As the sound waves travel outwards from the transducer and back again from a reflecting object, the stylus moves along the range scale. On the return of the echo, the amplified signal is fed to the stylus, leaving a mark on the paper, and thus indicating the range of the target. By observing the transducer bearing on the bearing repeater and reading off the recorded range, the essential information of range and bearing is known.

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 ABSTRACTER: Kathryn L. Osterhaug

2.1126 EXPERIMENTS WITH MONOFILAMENT NYLON GILLNETS

Carrothers, P. J. G. (Nanaimo, B. C., Biological Station, Fisheries Research Board of Canada)
Western Fisheries 59, 20, 54-56 (November 1959)

During the summer of 1959, several panels of monofilament nylon netting were used by fishermen of the commercial salmon gillnet fleet fishing out of Steveston, B. C. The panels were inserted into conventional gillnets and were fished in the Strait of Georgia near the outlet of the Fraser River.

The chief reason for trying the monofilament netting was to find a material that is less visible in water than the conventional multifilament nylon. Fine monofilament gillnets have been used successfully in European lakes for several years, but they are too weak to use with salmon. Manufacturing considerations limit the coarseness of the monofilament netting and, consequently, the strength of the gillnets made from it. Netting looms have less control over coarse than over fine filaments, and knots have greater tendency to spring open when tied with coarser filaments than with finer filaments.

Most of the panels that were tried this year were made of filament 0.5 millimeters (0.02 inches) in diameter. An experimental net was made using a filament that was 0.8 millimeters (0.03 inches) in diameter. The heaviest monofilament netting previously examined by the author was made of filament 0.35 millimeters (0.014 inches) in diameter.

The experimental netting was surprisingly flexible for monofilament nylon, but it was considerably stiffer and springier than conventional multifilament nylon netting. As a result of this springiness, the monofilament netting is relatively bulky. Monofilament nylon netting has less tendency to become tangled than does conventional netting while the net is being set, and it can be wound compactly onto the drum while being hauled.

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 ABSTRACTER: Kathryn L. Osterhaug

2.117 CONSTRUCTION OF ALUMINUM FISH ROOMS: STANCHIONS, POUND BOARDS AND LIGHT ALLOY FITTINGS

Anonymous
The Shipping World and World Shipbuilding 140, No. 3436, p. 449 (May 1959)
World Fisheries Abstracts 10, 21-22 (September-October 1959)

The Northern Aluminum Co. Ltd. (Bush House, Aldwych, London, W. C. 2) has issued a new practical handbook entitled Notes on the Construction of Aluminum Fish Rooms. These notes are primarily intended to give guidance on the planning and construction of trawler fish rooms in which the stanchions, pound boards and associated fittings are of aluminum alloy.

General fish room arrangement.--The construction of an aluminum fish room follows accepted principles, but with timber pound boards and galvanized steel stanchions replaced by suitable aluminum extrusions. It is usual to use aluminum for the permanent wing bulkheads. Aluminum linings have the advantage of being easily cleaned. The pound boards should fit into cleats on the stanchions to provide independent support for the shelf rest angles so that the vertical boards may be relieved of the direct load of the fish and ice from above. The shelves may be supported across the vertical boards themselves by means of a saddle section or a specially slotted rest bar. The shelf boards may normally be lighter than the vertical boards, although it is sometimes preferable to use the same section throughout, both in the interest of standardization and also to reduce the deflection of the shelves to a minimum.

Pound board section.--Section 20791, with an over-all depth of corrugation of $\frac{1}{2}$ in. (1.27 cm.) and a weight of about 1.03 lb./ft. (1.53 kg./m.) is designed primarily to replace the usual 1 in. (2.54 cm.) timber board. It has an ample margin of strength both from the point of view of the

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TROLLING GEAR

MONOFILAMENT NYLON GILLNETS

ECHO RANGING FOR HERRING

ALUMINUM FISH ROOMS

2.1126

The shingle weaver's knots in the monofilament nylon netting were well formed and well set. This was achieved by placing the loom in a hot room while the net was being manufactured.

In the water, the monofilament netting is less visible than multifilament netting. Greater catches were reported with monofilament netting than with multifilament netting by day in "green" water, although by night or in the river this difference was not noted.

It is important to note that the monofilament netting increased in mesh length to a much greater extent when wet than did multifilament netting. The 0.50 millimeter monofilament nylon stretches more under load than does high-tenacity multifilament nylon. Allowance must be made for this by selecting smaller mesh lengths than with other materials.

When breaking strength is considered, the monofilament netting is found to be weaker in comparison to weight than is multifilament netting.

Toughness is an estimate of the energy required to break the mesh and depends both on strength and on the amount of stretch under load. The 0.5 millimeter diameter filament netting is relatively tough because it has more stretch than have the other types of netting. Unfortunately, this toughness estimate involves the total stretch and does not consider elastic stretch to the exclusion of permanent stretch under load. Only the elastic part of the total stretch contributes toward the toughness required to hold a fighting fish.

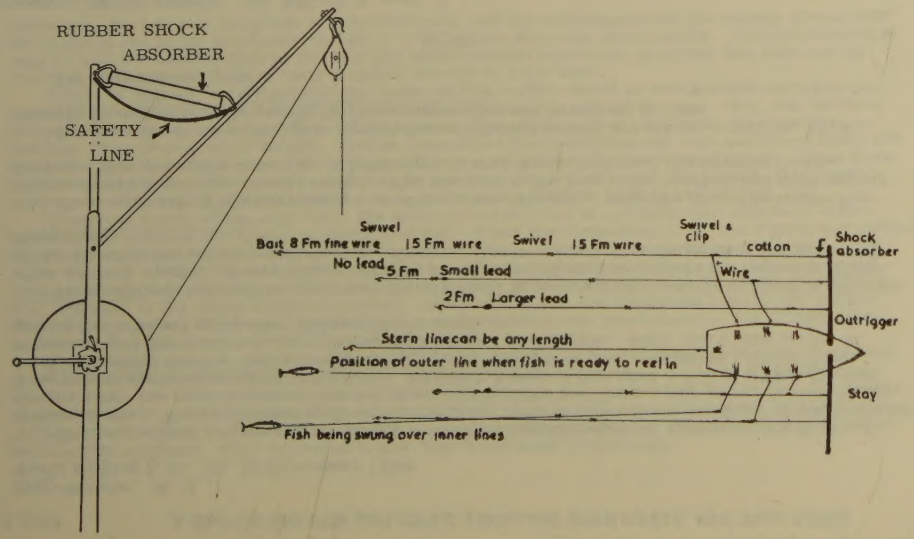
Obviously, many technical problems must be solved before monofilament nylon netting can be fully accepted for salmon gill nets. The netting should be stronger, either by using heavier monofilament or by improving the quality. The filament should be more flexible without excessively increasing the stretch under load and without losing stability of mesh length. The cost should be lower to compete with multifilament nylon netting. Also, many questions of application should be answered, such as what color the filament should be, what mesh length should be used, how much the web should be hung in on the lines, and how heavy the lead line should be. The fact that monofilament netting is less visible in the water than is multifilament netting should encourage solutions to these problems and answers to these questions.

2.117

loading of fish and ice, and of the safety of men standing or jumping on it, and passing each other during their normal work in the fish room. On a length of 3½ ft. (1.07 m.) the failing load of this board is over 1,000 lb. (454 kg.). Under a load of 300 lb. (136 kg.) the board will deflect about 1 in. but will immediately regain its shape when the load is removed. Section 20829 is a dual-purpose board designed to carry, with a minimum of deflection, fish bulked to any normal depth, and at the same time to be suitable for use in the vertical partitions. This section should therefore be selected if only one type of board is to be used throughout the fish room, but in other cases 20791 may be used for all shelving and 20829 for the vertical boards. Special section 12919 was designed for use in distant-water trawlers as a dual-purpose board in conjunction with a slotted rest bar or saddle section to carry the shelving, and has sufficient strength to support the heavy loads. In lengths up to about 4 ft. (1.22 m.); 11301 is a slightly heavier alternative; and 20356 is a similar section strengthened locally for use as a vertical board where conditions are especially rigorous--in a deep hold with no stanchion cleats and where the length of board is well over 4 ft.

Fish room stanchions. --In section RH 778, the taper of the jaws makes it possible to maintain the 1 in. gap without excessive thickness of the arms, and this taper has an incidental advantage in that if cleats are attached by riveting, any slight protrusion of the rivet in the inside will not foul the boards. This cleat is an ordinary angle section with a protrusion on one side that enables it to be easily and accurately located on the stanchion. It may be secured by welding or riveting, using in the latter case either solid rivets or Chobert rivets, both of ¼ in. (6.35 mm.) diam. The Chobert rivets are quite efficient. It was found that a mean failing load for a typical cleat assembly of the type described was about 0.6 tons for each rivet, a figure which could not be exceeded by equivalent solid rivets in single shear.

2.1122



2.116

The small-boat sonar set is a combined sonar-echo sounder installation that is especially designed for the 18-foot open boat that is used by the fishing master while he directs the shooting and handling of the purse seine. In this application of sonar, rapid scanning and the ability to keep contact with the shoals at close range are of prime importance. These characteristics are provided for by a simple joystick operation and by the high pulse-repetition rate of the recording unit. The hull unit is manually operated by means of the joystick with complete freedom for 360-degree training and 90-degree depression of the beam, and the joystick is always pointing in the direction of the sound beam.

While in use, these small 18-foot boats are naturally undergoing violet motions that complicate sonar operations. The simple form of stabilizing movement imposed automatically when operating the joystick has proved to reduce this drawback to a remarkable degree. By putting the joystick up in a vertical position, the set will work as an echo sounder. The fact that the transducer can be kept about 2 feet below the keel has virtually eliminated the troublesome aeration often encountered with small-boat sounders. The normal range of this small-boat sonar equipment is about 500 yards and somewhat more when sounding.

Tactics of sonar fishing. --The normal operating procedure in sonar fishing is to train the transducer from port to starboard in a stepwise manner, and to listen for echoes between each transmission. The target of any echo heard or recorded must first be classified so that time will not be lost in investigating false echoes.

A trained operator, by listening to the sound, can to a limited extent distinguish between echoes from herring shoals and echoes from other targets. The sonar targets should be verified at intervals by the use of the echo sounder.

Experience has shown that the operation of sonar equipment is easily learned by the average fisherman, but that the interpretation of echo traces requires experience and the development of skill before the maximum utilization of the equipment can be achieved.

2.1471 STATE OF DEVELOPMENT AND WORKING CONDITIONS OF FLOATING TRAWLS

Kajewski, G.
Fischereiforsching 1, No. 1, p. 1 (Aug. 1958) (In German)
World Fisheries Abstracts 10, 15-16 (May-June 1959)

Unlike the bottom trawl, the mid-water trawl has not yet developed into a generally recognized design. Basically, it differs from the bottom trawl by the shape of its rectangular or square opening, by the number of lastriches, usually 4 instead of 2 as with the bottom trawl, by the proportion of the top side to the lower side, the top net usually protruding over the lower side, and by its greater length. The smooth flow of water through the mid-water trawl is particularly important, and the meshes of the front part of the net have, therefore, to be especially wide. Considering these items, a number of mid-water trawls have been manufactured. The Danish Larsen trawl is towed by 2 boats. Its size varies. The smallest ones have an aperture of 8.5 x 8.5 m. (27.8 x 27.8 ft.) with a length of 54.9 m. (180 ft.). Net openings of 11 x 11 m. (36 x 36 ft.) to 14.6 x 14.6 m. (47.7 x 47.7 ft.) are mainly used for vessels of 50 to 120 h.p. or 120 to 250 h.p., respectively. A number of mid-water trawls are towed by one boat. The net opening of the Soviet mid-water trawl PINRO (see fig. over) is 13 x 13 m. (42.5 x 42.5 ft.) in size. Attention is drawn to the use of oval trawl boards especially, which are similar to some that are used for bottom trawls. Other trawls of this type are the Swedish Phantom trawl of K. H. Larsson, the Icelandic trawl of Breidfjord and the British Columbia trawl. The use of mid-water trawls depends on the specific behavior of fish. The fish shoal should be large and compact, it should not be too active, it should keep an even depth, the water should be turbid, or the effect of light small (at night, no phosphorescence of the sea), the water should not be too deep and the fish must not stay too far above the sea bottom. The success of the mid-water trawl is thus more dependent on the behavior of the fish than is a bottom trawl. Besides the biological conditions, the technical requirements have to be met. These include the exact detecting of the depth of the fish

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 ABSTRACTER: A. von Brandt

3.19 DETECTION OF AMINES PRODUCED ON IRRADIATION OF BEEF

Burks, Robert E., Jr.; Baker, Evelyn B.; Clark, Patricia; Esslinger, Jeanette; and Lacey, James C., Jr. (Southern Research Institute, Birmingham, Alabama)
Journal of Agricultural and Food Chemistry 7, 778-782 (November 1959)

Beef preserved by irradiation develops a characteristic unpleasant odor. Prior to the work of the present authors, several groups of workers had found chemical changes that were significant, but no work on amines as the cause of objectionable odor had been reported. Batzer and Doty (1955) found abnormally large amounts of volatile sulfur compounds in irradiated beef. Sribney, Lewis, and Schweigert (1955) found carbonyl compounds and peroxides; and Sharples, Blair, and Maxwell (1955) found ethylamine in irradiated aqueous solutions of alanine. Tolbert and Noller (1955) found that irradiation of dry glycine produced methylamine.

The present authors studied the volatile bases in beef in an effort to identify the compounds responsible for the characteristic unpleasant odor of beef that has been preserved by irradiation.

Experimental. -- Boneless sirloin butt was trimmed of excess fat and then ground to ensure thorough mixing. Each batch of meat was packed into No. 2 cans, frozen in dry ice, and shipped to the Materials Testing Reactor, Arco, Idaho, where one-third of the cans received an irradiation dose of 3.72 megarads, and another third received 2.33 megarads of gamma radiation. The remaining third of the cans constituted the control samples and received identical treatment, with regard to shipping and temperature--but no exposure to irradiation. All of the samples were kept in dry ice, until they were opened for examination.

The volatile bases were measured quantitatively by the Conway-Byrne microdiffusion method and by gas chromatography. The amine fraction of the volatile bases was estimated quantitatively by a

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 ABSTRACTER: Kathryn L. Osterhaug

2.9 THE NUTRITIONAL FACTOR

Ousterhout, L. E. (U. S. Bureau of Commercial Fisheries, College Park, Maryland)
Seafood Merchandising (Annual Review Number) 19, 13, 52, 53 (November 30, 1959)

No other class of foods can compete nutrition-wise with food from the sea. The multitude of available fish and seafoods not only can satisfy every taste, but also can satisfy most of the nutritional needs of man.

The human body required five main classes of nutrients in its diet: (1) proteins, composed of a collection of some 20 amino acids of which 9 are absolutely essential to the building and maintenance of all the tissues of our bodies, including muscle, brain, skin, bone, internal organs, and even fingernails; (2) calories, which furnish the energy necessary for the life and activity of every living cell in our bodies; (3) fats, often called polyunsaturated fatty acids, which have an important role in human metabolism; (4) vitamins, or a group of organic factors that are required for the many biochemical reactions that take place in the cells of our bodies; and (5) minerals, which are major components of the bony skeleton, the vital constituents of enzymes, and are present in the secretions of the many glands within us.

Protein. --The proteins from most animal products, including fish, essentially are of equal nutritional quality. That is, the patterns of their amino acid composition are very similar. Seafoods are equally good as sources of the nine essential amino acids as are meat or milk. These amino acids fortify and fill in the deficiencies present in the cereal or plant proteins we eat. Fish and shellfish have a nutritional advantage over some meats commonly eaten in that they usually are tender and therefore are easy to chew and can be eaten with ease by our senior citizens. It has not been shown whether this actually results in a better digestion and assimilation of the protein, but at least it can result in a greater protein intake in the geriatric diet and thereby contribute to a happier, more

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 ABSTRACTER: Kathryn L. Osterhaug

3.2 ENGINEERING ASPECTS OF RECENT RESEARCH PROJECTS IN THE PRESERVATION OF FISH

Eddie, G. C. and Pearson, S. Forbes (Torry Research Station, Aberdeen, Scotland)
Chemistry and Industry No. 46, 1427-1435 (November 14, 1959)

This paper is a review of work carried out during the last 12 years by the staff of the engineering section at the Torry Research Station on the preservation of chilled and frozen fish. The research is aimed at improving the quality of landed fish and improving the economics of the industry. Other work is directed toward improving handling, processing, and transport of fish on shore. The two specific aims of this work were to improve the existing practices and equipment and to develop better means of preservation.

Quick freezing. --The work at Torry that was done before the war was related to fish frozen within 24 hours of catching. It has now been established that cod, if properly gutted, washed, and stowed in ice, may be kept for up to 3 days before freezing, and if stored at -20° F. the frozen fish will be equal to very fresh fish for all purposes. The limit of 3 days in ice still rules out the possibility of freezing much of the white fish catch on shore, if it is to be further processed after thawing. Consumer packs of frozen fillets can be produced from fish that are 6 to 9 days old, but if the seasonal surpluses of white fish are to be saved for human consumption, at least a portion of the stocks must be acceptable in place of iced fish for smoking and for the wet fish trade and must therefore be frozen within 3 days of catching. Other reasons for freezing on board are connected with the economics of trawler operation.

Freezing at sea. -- It was believed that the average quality of the landings by distant-water trawlers would be raised if the early part of the catch was frozen at sea. Voyages could be extended and the economics of catching improved by increasing the relative amount of fishing-time to

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 ABSTRACTER: John A. Dassow

FLOATING TRAWLS

NUTRITIVE VALUE OF FISH

AMINES IN IRRADIATED BEEF

REFRIGERATION OF FISH

2.9

healthful life for these people.

Calories.--You may select fish with almost any fat content you wish, from those containing an amount barely sufficient to provide the polyunsaturated fats you require up to fish so fat that they can be classed as oily. The lower the fat content, the lower the calories--the higher the fat content, the higher the calories. In addition, the calorie content of a ready-to-eat seafood depends upon the method of preparation. There is a big difference in the calorie content of plain, peeled, cocktail shrimp and the same shrimp dipped in a calorie-rich batter and deep-fat fried.

Vitamins.--How do fish rate as sources of vitamins? Fish possess the vitamins that are common to other meats, chiefly the B group of vitamins. Although, like most other muscle-type meats, fish are not particularly rich sources of most of these vitamins, neither are they poor sources. If you eat a normal serving of a well-prepared fish product, you will get a reasonable serving of most of the B family of vitamins. To obtain the fat-soluble vitamins, you will have to be selective of your fish or go elsewhere. Most fat fish contain appreciable amounts of vitamin A and D, but the lean fish do not.

Minerals.--When it comes to the minerals it is an even better story. There is hardly a mineral known that is not found in fish. Not only are excellent levels of all the known necessary minerals present in seafoods, but there are traces of other minerals present for which no need has been shown. For all we know, these may also be necessary in human nutrition. Most fish are better sources of calcium and phosphorus than are most other meats, and the number of trace-minerals that fish contain is remarkable. Iodine, magnesium, manganese, cobalt, iron, copper, zinc, and many other minerals have been shown to be present in most fish analyzed.

The wide variety of fish and shellfish available results in the need for a tremendous amount of analytical work in order to determine their mineral and vitamin contents. The analyses performed so far have not covered the whole field but merely have provided an indication of what representative samples of most species contain.

3.2

voyage-time in a year. The practicability of freezing fish on board an existing trawler was proved by the successful modification and tests of the trawler Northern Wave.

Among the accomplishments of these tests were a suitable method for supplying and metering the refrigerant to the vertical-plate freezer, and a modification of the freezer to allow trouble-free release of the frozen blocks of fish. Another development was the design of special light-weight insulated doors and a hatch plug of resin-bonded glass fiber to reduce fatigue and risk of injury to the workmen in bad weather.

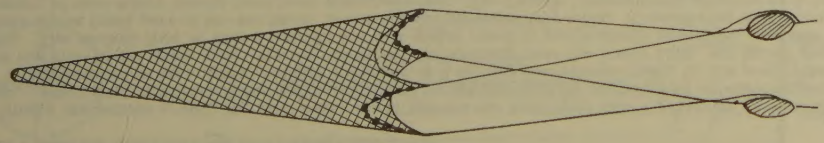
Further studies were concerned with improving operating efficiency by means of minimum propulsive power with constant-power propulsion rather than constant-torque. The Torry research trawler, Sir William Hardy, is the first British diesel-electric trawler with a constant-power propulsion unit.

Freezer design and performance.--Improvements in performance of the vertical-plate freezer have been made and some variants in design were tested. These include study of improved heat transfer in the freezer as related to primary refrigerant supply, the use of a secondary refrigerant such as methanol and water "brine," and modified designs of freezer plates. To establish heat transfer coefficients from refrigerant to plate and thus provide data of general use, a steady-state plate tester was built. Improved methods of determining freezing time and thermal arrest by use of electrical resistance measurements of the fish muscle are under development.

Cold-store design.--To minimize the desiccation of the fish during cold storage, jacketed construction was studied. The cold storage for experimental stores at Torry was the first to be erected in the United Kingdom, using the jacketed construction principle. The main reason for its construction was to allow separation of the effects of temperature and humidity upon product quality. Experience shows that desiccation was very low and that temperatures were steady for the small size of the individual rooms.

2.1471

shoals, an accurate adjustment of the fishing gear to the depth, a constant control of the position of the fishing gear during fishing, and the control of the contents of the net. Whereas there no longer exist any difficulties in detecting the fish, the depth-regulation by the length of the warps and speed is difficult. A speedometer is required that works with an accuracy of at least 0.1 knot. The depth-measurement during fishing is a particular problem. The necessary accuracy of the adjustment of the net is about ±1.5 m. (±5 ft.). Whereas the measurement of the depth can still be made in a relatively simple way by means of pressure gauges, the transfer of the measured value from the net to the vessel is a difficult technical problem. A transfer by cable or by underwater transmitter has not yet been satisfactorily solved. The aim will be a trawl that can be used on the bottom as well as in all depths of water, possibly combined with electrical fishing.



The Soviet mid-water trawl PINRO

3.19 (Cross Reference: 7.81)

colorimetric method and by gas chromatography. Methylamine and ethylamine were identified by gas and paper chromatography as the major components of the amine fractions, with at least four other amines also being detected.

Results and discussion.--The authors found that the volatile bases contribute to the odor of irradiated beef. This was demonstrated by the fact that acidification changed the odor of the condensate obtained by lyophilizing irradiated beef. That nonbasic compounds also are important is shown by the fact that acidification did not completely deodorize the condensate.

The excess of volatile base in irradiated beef was measured quantitatively, and the difference between the irradiated and unirradiated samples proved to be significant at the 1-percent level. The amounts of volatile base in the samples ranged from 120 to 145 parts per million, calculated as ammonia.

Ammonia constituted 92 to 95 percent of the total volatile base in irradiated beef. Data obtained by paper and gas chromatography showed that the bases other than ammonia consist of at least six amines; the two major components were methylamine and ethylamine. The irradiated sample contained 10 to 20 times more volatile amines than did the unirradiated samples.

It now seems evident that many different compounds are responsible for the odor of irradiated beef. Some compounds may have definite effects on the over-all odor when they are in combination with similar compounds, although each may be present in a concentration that would be undetectable if the compound were alone. The unidentified amines may be important components of the over-all contributions of the bases. Some of the unidentified amines may have intense odors and thereby contribute more to the odor than those identified.

2.1474 A NEW FISHING METHOD FOR INCREASING THE PRODUCTION OF PRIME FISH IN THE COASTAL FISHERY

Predel, G.
Deutsche Fischerei Zeitung 5, No. 7, p. 200 (July 1958)
World Fisheries Abstracts 10, 13-14 (May-June 1959)

Double traps have been very successful in the eel fishery on the Isle of Ruegen, off the German Baltic coast. These are small fyke nets with 5 rings and 2 inner valves. The rings are 40 to 45 cm. (15¾ to 17⅞ in.), 35 to 40 cm. (13¾ to 15⅞ in.), 30 to 35 cm. (11-7/8 to 13¾ in.), 25 to 30 cm. (9-7/8 to 11-7/8 in.), and 20 to 25 cm. (7-15/16 to 9-7/8 in.), resp., in diameter. They are made fo wood, but it has been suggested that they be made of plastic material. Plastic tubes should not be used, as otherwise the lift or buoyancy would be too great. Two of the these fyke nets of about 1.7 m. (5½ ft.) in length are always connected to a leading net of 3 m. (9.8 ft.) in length. The first ring and the connecting leading net are weighted with sinkers. Corks 4 cm. (1-9/16 in.) long and 3 cm. (1-3/16 in.) in diameter are attached to the upper edge of the leading net.

Thirty to 50 of these double fyke nets are connected to each other at their ends thus forming long rows, and are set along the shore for eel fishing. The fyke nets are controlled either daily or every second day and a fisherman can handle 300 to 500 nets. Fishing with 500 nets is considered profitable. Fishing only takes place in summer from mid-July to September because these nets failed in fishing for eels migrating in the autumn; the average catch per day for 382 nets in the Baltic is 50 kg. (110 lb.). Replacing the existing line fishery by fishing with fyke nets has been suggested because it is difficult to obtain the required bait for line fishing. Comparing the local costs of making these fyke nets with the costs of the existing pound traps proved that the small double fyke nets are cheaper and, moreover, that they are not damaged by storms.

See illustration, over.

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4.21 RELATIONSHIP OF MEAT PIGMENTS TO LIPID OXIDATION

Younathan, Margaret Tims and Watts, Betty M. (Florida State University, Tallahassee)
Food Research 24, 728-734 (November-December 1959)

Oxidation of tissue lipids accounts for much of the undesirable rancidity that occurs in stored, cooked meat products. This reaction is more pronounced in uncured meats than in cured meats. Available evidence indicates that the site of oxidation is a protein-bound phospholipid fraction not readily extractable with fat solvents. Earlier work, reviewed by Watts (1954), demonstrates that this reaction brings about the destruction of the pigment as well as oxidation of the fat, but the mechanism of the reaction is not completely understood. Banks (1944) suggested that the active catalyst results from a combination of fat peroxide and iron porphyrin. Maier and Tappel (1954) proposed that catalytically active hemes form unstable compounds with fat peroxides and that these then decompose to give two free radicals, each of which is capable of initiating an oxidation chain.

Purpose.--The work reported here was designed to study lipid oxidation and accompanying odor changes in cured and uncured cooked pork. The authors hoped that their findings might explain the catalytic activities of the heme pigments in meat and apply directly to problems of meat storage.

Methods and materials.--Fresh pork hams were purchased from a local slaughtering house. Previous histories were unknown. The meat was ground once and the ground pork thoroughly mixed by hand in order to obtain a homogeneous product. Curing salts, when used, were in the proportion of 2.0 percent sodium chloride and 0.02 percent nitrite ion as sodium nitrite. A phosphate antioxidant, sodium tripolyphosphate, at a concentration of 0.5 percent was added to some samples. All salts were thoroughly blended and added to the raw meat in the dry state. Weighed portions of meat (500 grams) were packed tightly into No. 2 C-enameled cans, sealed immediately, and cooked about 1 hour in a steam bath to an internal temperature of 70° C. After the meat was cooked, the cans were

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 ABSTRACTER: Martin Heerdt

3.2381 KEEPING RAINBOWS IN COLD STORAGE

Nelson, Richard W. (U. S. Fish and Wildlife Service, Seattle, Washington)
U. S. Trout News 4, 11-12 (November-December 1959)

During the past several years, the Seattle Technological Laboratory, Bureau of Commercial Fisheries, has carried out research on fresh-water fish in cooperation with The Refrigeration Research Foundation. A part of the fresh-water fish program has been devoted to studying the cold-storage characteristics of rainbow trout. The objectives of the study were: (1) to evaluate glazing as a means of extending the storage life of rainbow trout and (2) to determine the storage life of rainbow trout at various temperatures.

Preparation and examination methods.--All of the fish for the study were obtained freshly dressed from a local trout farm. They were frozen individually on metal trays in a blast freezer at -20° F. The fish to be used in the test to evaluate glaze were either ice glazed, glazed with a solution of 2 percent corn sirup solids, or were not glazed. The fish to be used in the study to determine storage life were all iced ice glazed. All of the fish were packed in polyethylene bags and placed in waxed fiber cartons. The cartons were overwrapped with waxed kraft paper. The samples for the glaze study were stored at 0° F. Those for the study of storage life were stored at +20° F., +10° F., 0° F., and -20° F.

The samples were examined by organoleptic methods and the resulting ratings were based on appearance, odor, texture, and flavor. Chemical analyses were used to complement the organoleptic scores.

Effect of glaze.-- The trout that were held at 0° F. without a glaze became slightly rancid within 4 months and were unacceptable after 6 months of storage. Trout that were glazed with either pure

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 ABSTRACTER: Richard W. Nelson

4.91 CHROMATOGRAPHIC IDENTIFICATION OF THE ANTILIPAEMIC X FACTOR OF THE UNSAPONIFIABLE FRACTION OF CRUDE VEGETABLE OILS

Nath, M. C.; Saikia, A.; and Uppin, B. I. (Department of Biochemistry, University, Nagpur)
Nature 184, 1635-1636 (November 21, 1959)

Introduction.--Beveridge et al. (1957) and Jones et al. (1956) believe that there is some unknown factor in crude corn oil and in other vegetable oils that is more effective in lowering the elevated serum cholesterol and phospholipid levels in atherosclerosis than are purified essential fatty acids alone. Jensen et al. (1958) reported that crude oil contains an unidentified nutritional factor that is more beneficial in increasing the egg weight and hatchability than are essential fatty acids. Recently, Grande et al. (1958) have shown that there is a factor X present in the unsaponifiable fraction of crude corn oil that acts as a better antilipaemic agent than do purified essential fatty acids.

Researchers at the authors' laboratory have recently reported that glucose cycloacetoacetate, a product of condensation of glucose with ethyl acetoacetate that has been shown by Gonzales and Aparacio (1945) to be 2-tetrahydroxy butyl, 5-methyl, 4-carbethoxy furan, on hydrolysis with 2N hydrochloric acid, gives rise to 1:2 dienol glucose. Hydrolyzed glucose cycloacetoacetate has also been shown to have a pronounced effect on maintaining the normal level of cholesterol in serum and tissues in animals having different kinds of experimental atherosclerosis and to be more effective for this purpose than the essential fatty acids, vitamin B_{12}, or inositol.

In view of the fact that 1:2 dienol glucose shows a greater beneficial effect than is shown by the use of essential fatty acids or vitamin B_{12} and because that effect is similar to the effect of crude

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 ABSTRACTER: Kathryn L. Osterhaug

DOUBLE TRAPS

FREEZING RAINBOW TROUT

PIGMENTS VS. LIPID OXIDATION

ANTILIPAEMIC FACTORS

3.2381 (Cross Reference: 1.37)

ice or a 2-percent solution of corn-sirup solids were still in acceptable condition after 18 months of storage at 0° F. The 2-percent solution of corn-sirup solids, when used as a glaze, gave results that were slightly superior to those of the pure ice glaze. This was the result of the more resilient coating provided by the corn-sirup solids.

Storage life at various temperatures. -- The trout stored at +20° F. were unacceptable after 2½ months of storage. The trout stored at +10° F. were unacceptable after 4½ months. Those stored at 0° F. and -20° F. were in acceptable condition after 18 months of storage. The examinations were terminated at 18 months because all of the samples had been used.

Recommendations. -- The following recommendations will help the trout packer to consistently produce a high-quality frozen trout: (1) pack only high-quality fish, (2) freeze at -20° F. or lower, (3) protect frozen whole fish with a glaze, (4) protect the product with suitable packaging materials, (5) store at 0° F. or lower, (6) keep storage temperatures constant, and (7) encourage the use of recommended storage temperature during transport, distribution, and retail storage of your frozen trout.

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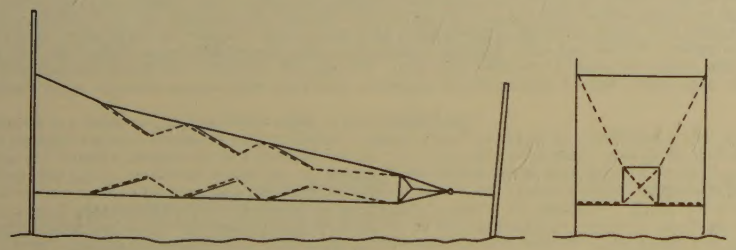

Diagram of the braced bag without rings, side and front views.

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linseed oil, groundnut oil, or sesame oil, the authors decided to study whether the unknown X factor of the crude vegetable oil bears any resemblance to the 1 : 2 dienol glucose when subjected to circular paper chromatography.

Experimental. -- The unsaponifiable fractions of corn oil, groundnut oil, linseed oil, and hydrogenated groundnut oil were extracted by the method of Grande et al. (1958). The fractions were purified by removing the coloring matter and other impurities with Norite followed by fuller's earth. Twenty μl. of the purified unsaponifiable fraction was spotted on Whatman No. 1 filter paper of 11-inch diameter with an inner circle of 1-inch radius. The technique of Nath and Bhattathiry (1956) using butanolacetic acid-water in the ratio 4 : 1 : 5 was followed and the color developed with phosphomolybdic acid reagent.

Results. --The data show that 1 : 2 dienol glucose has the same R_f value (0.92) as that of the X factor of the unsaponifiable fractions of corn oil and groundnut oil. Hydrogenated groundnut oil did not, however, show the presence of this band, which indicates that the X factor is destroyed by hydrogenation. It is interesting to note that glucose cycloacetoacetate, after acid hydrolysis for more than 15 minutes, gives rise to another band lower than that of 1 : 2 dienol glucose. It is probable that prolonged acid hydrolysis of glucose cycloacetoacetate may cause a shift of the double bond of part of the dienol glucose from the 1 : 2 to the 2 : 3 position, and this may be responsible for the second band in the chromatogram.

The X factor of the unsaponifiable fraction of crude oils, which Grande et al. (1958) have suggested is a potent antilipaemic and antiatherosclerotic factor, appears to be 1 : 2 dienol glucose, which had previously been reported by the authors to prevent and cure experimental atherosclerosis of various types.

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opened immediately and the meat was reground, thoroughly mixed, and stored at refrigerator temperature for subsequent assays.

Oxidative rancidity was measured by the 2-thiobarbituric acid (TBA) test as outlined by Turner et al. (1954), except that optical densities were read on the Evelyn photoelectric colorimeter with the aid of a 540 filter. Intensity of rancid odor was rated by a panel of judges on the following scale: not detectable, just detectable, moderate, moderately strong, strong, and very strong. At each examination, the odor of a test sample of meat was compared with the odor of a freshly cooked reference sample of meat that contained a phosphate antioxidant.

Results. --The relationship of cured and uncured cooked meat pigments to oxidation of tissue lipids suggests that the ferric form of the pigment is the active catalyst in tissue rancidity. Uncured cooked meat, which contains ferric, denatured, globin hemochromogen, showed high TBA values shortly after being cooked. No such increase was noted in cured meat samples in which the pigment was present as pink, ferrous, nitric oxide hemochromogen. When brown, ferric, oxidation products appeared upon subsequent storage of the cured meats, TBA values increased. Rancid odors that developed in stored cooked meats could be correlated with an increase in TBA values.

Discussion. --The results may be explained by the hypothesis that ferric hemochromogen is an active catalyst for unsaturated fat oxidation, whereas ferrous, nitric oxide hemochromogen is not. In previous work with 16 cured hams treated in various ways, the time required to reach a TBA value of 0.5 ranged from less than 2 days to more than 14 days. In each case, however, the loss of pink color was accompanied by fat oxidation. TBA values greater than 1.5 were rarely observed in cured meats, although values ranging from 4.0 to 6.0 are commonly found in uncured cooked pork.

3.237 EFFECT OF PRETREATMENT AND TYPE OF PACKAGING MATERIAL ON QUALITY OF FROZEN FRIED CHICKEN

Carlin, Agnes Frances; Pangborn, Rose Marie V.; Cotterill, Owen J.; and Homeyer, Paul G. (Iowa Agricultural Experiment Station, Ames)
Food Technology 13, 557-560 (October 1959)

Thighs, legs and breasts of broilers, untreated or precooked for 3 or for 10 minutes, were packaged in Cryovac, polyethylene or aluminum foil and stored at 0° F. After storage for 0, 5, 10, and 15 weeks, samples were removed for evaluation. Weight changes that occurred during pretreatment, storage, thawing and final cooking were determined. A taste panel of 5 members scored the broilers for meat flavor, skin flavor, tenderness, juiciness, meat off-flavor and skin off-flavor.

Increases in weight of raw chicken parts, after the coating of milk and flour had been applied, averaged 7 percent. During precooking, samples cooked 3 minutes lost some weight but had a net gain of 3 percent. Samples precooked 10 minutes, however, had a net loss of approximately 10 percent. In general, for either the control or the precooked broilers packaged in aluminum foil, Cryovac or polyethylene, there was little or no change in weight throughout storage. Only the untreated broilers exhibited drip losses during thawing and there was no relationship between the quantity of drip, length of storage, type of packaging material or pH of the drip.

During the reheating of the thawed precooked broilers, there was an average loss in weight of 23 percent for samples precooked 3 minutes and 14 percent for those precooked 10 minutes. From the original raw weight to the final cooked weight (that is, when broilers were ready to eat) precooked broilers decreased 20 to 26 percent in weight, untreated controls decreased 16 percent.

There was a correlation between weight losses and juiciness of broilers. In most instances,

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6.132 EDIBLE PROTEIN FROM GRASS AND OILSEEDS

Anonymous
Food Manufacture 34, 398-399 (October 1, 1959)

Introduction. -- Almost any variety of vegetable material can be made to yield protein directly usable as human food by an impulse rendering process now in use by a British firm in London.

Process. --Grass or similar vegetable material is fed into a vessel in which beaters revolve and send strong shock waves through a constantly flowing stream of slightly alkaline water. These waves burst open the cells of the material and release (1) a protein-oil-water solution, (2) carbohydrates, and (3) fiber. Fiber is removed on a virbating screen, washed, dewatered, and made ready for paper or wallboard manufacture. Insoluble carbohydrates are washed and separated from the water by centrifuging. Protein is precipitated from solution with dilute sulphuric acid and collected in a basket centrifuge as a paste containing protein, water, and some oil. This mixture is solvent extracted azeotropically with toluene to dry the protein and to remove all fat.

Products. -- Grass protein, which is grey-blue in color, has excellent nutritional value for use in soups, meat pastes, sausages, and similar foods. One of the most potentially valuable byproducts of grass is a syrup containing chlorophyll, carotene, xanthophylls, sterols, steroids, and possibly vitamin E.

Yield and cost estimates. -- From fresh grass containing 80 percent water, the process will yield about 2.5 tons of pure protein, 7 tons of fiber, and 0.6 tons of chlorophyll syrup. A factory turning out 5,500 tons of protein per annum would need 50,000 kilowatt hours of power per week; however, the fiber produced could be used as fuel to produce some of the power.

See illustration, over.

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 ABSTRACTER: Martin Heerdt

6.132 INDUSTRIAL FISH SERIES--ARTICLE 2: HOW TO PLAN THE PRODUCTION OF FISH MEAL FROM TRASH FISH

Robas, John S.
Fish Boat 4, 37, 39, 41 (November 1959)

The simplest way to utilize trash fish is to dry the fish and grind them into meal for sale to the poultry and hog feed industries. Beautifully designed plants in both the United States and Europe operate quietly and without offensive odor and yield a high-quality fish meal. The writer inspected a large, modern reduction plant in Esbjerg, Denmark, 2 years ago, which, in many ways, was a model operation. It had shiny equipment, spotless buildings, even white-tiled walls that made the fish factory resemble a dairy. The plant was owned cooperatively by the operators of a fleet of 200 trawlers who supplied it with herring and other industrial fish. The huge fume-washing towers and the large through-put of sea water kept the plant virtually free of odor.

Size of the plant. -- Somewhere between a sun-drying operation and a huge factory lies a plant of proper size to utilize the available trash fish. In planning such a plant, the first task is to match the machinery to the amount of fish, keeping in mind that a small, busy plant will be far more profitable than a large plant partially idle.

Let us assume that a shrimping port has a group of trawler owners interested in utilized trash fish. As a start, we would say that a minimum of 12 good, inshore trawlers should be available throughout the year. Let us assume that these vessels are averaging 25,000 pounds of shrimp per year. Using the 10:1 ratio, each boat would produce 250,000 pounds of trash per year, or a fleet total of 3 million pounds for the 12 boats. This production would require an estimated 200 fishing days per year. What can be done with 1,500 tons of trash fish delivered over a period of 200 days? This is an average of 7½ tons of trash fish per operating day including fluctuations from 1 to 25 tons per day. Our machinery must be able to handle these swings and fluctuations at a profit.

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 ABSTRACTER: Kathryn L. Osterhaug

6.132 INDUSTRIAL FISH SERIES--ARTICLE 3: HOW TO SELECT THE MACHINERY FOR A SMALL WHOLE MEAL PLANT

Robas, John S.
Fish Boat 4, 35-36 (December 1959)

The raw box. -- In a fish-meal plant designed for minimum investment, it is assumed that hand-unloading from the boats will be employed. A raw box capable of storing 500 standard, fish boxes of fish will be adequate. A storage box that is 18 feet long, 10 feet wide, and 8 feet deep, with the bottom sloping into a conventional chain drag, is in use at a plant in Southport, North Carolina. The difficulty with any raw box is that a man is required to feed the fish into the chain drag or conveyor leading to the plant. The supply of fish to the dryer must be relatively constant. The problem of automatic feed in the raw box has been neatly solved by an Ocean Springs, Mississippi man, who designed and built a live-bottom raw box that incorporates a number of motor-driven screws in the bottom of the box. These screws have variable-speed drives so that a constant feed rate to the dryer can be established.

A steel raw box is to be preferred to one of wood. The steel unit will be much easier to keep clean and odor-free, and it can also be more readily refrigerated if this becomes desirable. The machinery for transferring the fish from the raw box to the dryer can be simple. A chain drag in a wooden trough is commonly used, or a simple screw conveyor. A magnetic trap for tramp iron to keep odd bits of steel out of the machinery must be incorporated into the design. The commonest types of tramp iron from shrimp trawlers are 3/8-inch shackles and an occasional turnbuckle, either of which can badly damage a grinder.

Calculating dryer size. -- All design questions ultimately hinge upon the capacity of the dryer. Our basic premise is that the plant will handle 1 ton of raw fish per hour. Since trash fish are

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 ABSTRACTER: Kathryn L. Osterhaug

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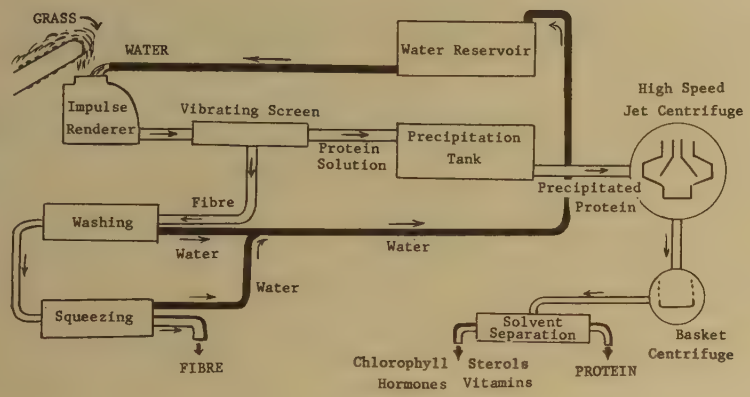

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essentially 75 percent water, we must calculate as follows:

2,000 lbs. x 76 percent = 1,520 lbs. of water
plus 480 lbs. of bone-dry solids
2,000 lbs.

We will not be producing bone-dry material. Commercial fish meal is sold at moisture contents ranging from 5 to 10 percent, with an average of 8 percent. We can therefore subtract 38 pounds of water from the total water and add 38 pounds to the weight of meal produced. Thus, 1 ton of raw fish will give us 518 pounds of fish meal, and we will have to evaporate 1,480 pounds of water to get it. We thus should look for a dryer in the 1,500 pounds-per-hour class. The easiest and best installation will result when the dryer, furnace, cyclones, and other equipment come from the manufacturer mounted on I-beam steel bases so that installation is more a matter of levelling than of constructing heavy concrete foundations.

Choice of fuel. -- Fuel for the dryer is a matter of availability. Natural gas is more convenient and Bunker "C" oil is cheapest. No. 2 diesel oil probably is most available to the average shrimper, but two virtues of natural gas should not be overlooked: it produces a fine, light-colored fish meal that is very attractive, and the furnace can be constructed without fire-brick lining, using an air-cooled furnace.

Odor control. --Many potential trash-fish operations are located fairly close to residential areas. Odors from a fish-meal dryer are usually regarded as objectionable. Odors can be controlled or reduced through the use of washing towers, but these towers are not wholly effective and require a large through-put of water. Chemical masking agents or "anti-odors" injected into the dryer stack are also useful; the most effective and complete odor control is achieved through burning the noxious elements in the dryer furnace. Burning odors is not as simple as it seems. Some odorous elements are fire-resistant and only in recent years, with the development of the platinum catalyst, has burning been relatively simple. An effective odor-control system will add about 20 percent to the basic cost of the dryer itself.

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scores for juiciness were lowest for broilers precooked 10 minutes, intermediate for those precooked 3 minutes, and highest for untreated control broilers.

After 15 weeks of storage at 0° F., untreated broilers were superior to precooked broilers in all palatability factors that were tested. The kind of packaging used did not significantly affect the flavor changes that occurred in untreated or in precooked broilers. Broilers precooked for 3 minutes prior to freezing developed more off-flavor than did broilers precooked for 10 minutes. Flavor changes occurred in the meat as well as in the skin of the precooked broilers.

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If capital were unlimited, we could install a refrigerated storage or "raw" box to hold small catches for several days until we had 5 or 10 tons to run. Because capital is scarce refrigeration is out. We must process these fish as they are delivered. Our hypothetical plant must therefore be small. In the beginning, the trash-fish operator should set his sights on a plant that will operate profitably on 1 ton of fish per hour. A plant this size can be used to handle the small catches and, on days of bumper catches, can be operated around the clock. If this small plant is profitable and additional supplies of fish are available, a second or larger unit can be installed. A plant smaller than 1-ton-per-hour would have all the problems of a larger plant--but without the capacity needed to be profitable.

Processing methods. -- Certain plant design criteria must be met in order for the operation to be profitable: (a) it must require a minimum of capital investment; (b) it must operate simply, with one man--no highly skilled labor should be required; (c) it must produce a uniform high-quality product which meets market demands; and (d) it should operate with as little odor as possible.

Are we interested in fish meal, fish oil, and condensed fish solubles from an integrated plant? Or can we be satisfied with just one product-- whole fish meal? Any fish is composed of three broad groups of compounds--solids, oil, and water. Trash-fish species do not contain large amounts of oil. The typical trash fish contains from 2 to 6 percent body oil. Even if by cooking and pressing we could get all the body oil out of the fish, the market price is so low (about 8 cents per pound) that it is advisable to leave the oil in the fish. Left in the fish, the oil adds weight and it helps hold down dust in the fish meal. It is suggested that the small fish-meal plant: (1) have an approximate capacity of 1 to 5 tons of raw fish per hour; (2) produce whole meal only, without attempting to recover the fish oil; and (3) use a recycle dryer in the interest of simplicity of operation, low initial investment, reduced labor requirements, and high quality of product.

3.5 PREVENTION OF RED DISCOLORATION IN SALT FISH

Torres Botelho, A.
Boletim da Pesca 11, No. 58, p. 11 (March 1958) (In Portuguese)
World Fisheries Abstracts 10, 31-32 (September-October 1959)

A considerable spoilage of salted cod takes place in Portugal due to reddening. Such spoilage is more pronounced in cod caught on the Grand Banks than off Greenland; apparently this is influenced by the difference in hold temperatures of vessels operating on the two grounds.

Studies conducted at the Laboratories of the Comissao Reguladora de Comercia de Bacalhau (CRCB) show that at temperatures between 37° and 40° C. (98.6° and 104.0° F.), with an average of 35.5° C. (95.9° F.), the red pigmentation appears in 2 weeks and increases rapidly during the following days; at 16° C. (60.8° F.); with variations between 13° and 20° C. (55.4° and 68.0° F.), the reddening appears in 5 weeks and the growth is slow; but if the temperature goes down to 5° C. (41.0° F.), with extreme limits between 3° and 7° C. (37.4° and 44.6° F.), no reddening appears in 4 months.

Based on these findings as well as on those of research on halophilic bacteria in other parts of the world, the CRCB recommended measures for periodic fumigation of fish holds. The recommended procedure is:

1. Clean fish holds with water under pressure taking particular care to remove salt and dirt from crevices in corners and joints.

2. Put all handling equipment on board into the hold and wash as in 1.

3. While the hold is still damp, fire commercial sulphur at 20 g. (0.6 oz.) for every cubic meter

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 ABSTRACTER: F. Lopez-Capont

6.14 SPONTANEOUS HEATING OF FISH MEAL--II.

Van den Broek, C. J. H. (University of Utrecht, The Netherlands)
Food Manufacture 34, 387-390 (October 1959)

Introduction. --This is part two in a review of the spontaneous heating of fish meal.

Oxygen. -- Higher peroxide values are found in fat from meal that has been conveyed pneumatically from the dryer to the storage house than in fat from meal that is bagged straight from the dryer. Oxidation will be facilitated if the meal is finely divided. Thus, at all stages of storage, unmilled meal cures at a slower rate than does milled meal.

If heat is an activating agent during meal processing, the opposite effect or de-activation occurs when dry meal is heated. Meal that was brought to 122° F. in an atmosphere of nitrogen and then allowed to heat spontaneously for 6 hours in oxygen to 156° F. produced heat at only 30 percent of the rate of the control that had not been preheated. These findings are corroborated by the experience of a factory manager who said that he could safely stack his fish meal after it had been heated for 4 hours to approximately 160° F.

Moisture. -- Fish meal containing less than 6 percent, or more than 12 percent of moisture must be contained in hermetically sealed, metal-lined boxes or in air-tight metal containers, according to the National Fire Protection Association in the United States. They also report that it is dangerous to package overdried meal or meal that is over 100° F.

Fish meal, unless protected by a moisture-proof barrier, takes up moisture very rapidly from the surrounding air. Very dry meal or meal with a high water-soluble content is extremely hygroscopic. Dreosti found an immediate increase in temperature as dry meal absorbed moisture. This

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 ABSTRACTER: Martin Heerdt

6.193 ABILITY OF CORN FERMENTATION CONDENSED SOLUBLES TO REPLACE UNIDENTIFIED GROWTH FACTOR SOURCES FOR CHICKENS

Russo, Joseph M. and Heiman, Victor (Corn Products Company, Waverly, New York)
Poultry Science 38, 1324-1328 (November 1959)

Introduction. -- In previous experiments conducted by the authors, chick growth was improved by the addition of corn-fermentation condensed solubles to a variety of practical chick rations.

Purpose. --The work reported here is concerned with (1) the effect of substituting corn-fermentation condensed solubles for fish meal, (2) for condensed fish solubles, and (3) for dried whey product in the diets of broiler chicks.

Experiment I. --Four studies were conducted to evaluate corn-fermentation condensed solubles as a replacement for 4.5 percent fish meal in a starter ration for broilers. The starter ration, which was believed adequate in known nutrients and typical of many formulated broiler rations, contained 23 percent protein and yielded 1,382 Calories per pound of feed. When fish meal was replaced with corn-fermentation condensed solubles or merely removed, protein, calcium, phosphorus, and sodium chloride were adjusted to the levels of the original starter ration.

Day-old White Leghorn males were used in all four studies, but there were 20 chicks per group in each of the first two studies and 25 chicks per group in each of the last two studies. Each ration was fed to three replicate groups. Electrically heated battery brooders were used for all four studies, and the duration of each study was 28 days.

Experiment II. --Six studies were conducted to evaluate replacement of condensed fish solubles and dried whey product in the Animal Nutrition Research Council (A.N.R.C.) Reference Chick Diet

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 ABSTRACTER: Martin Heerdt

6.32 ISOLATION OF SULPHATED SUGARS FROM SOME ALGAL POLYSACCHARIDES

Painter, T. J. (Atlantic Regional Laboratory, National Research Council, Halifax, Nova Scotia)
Chemistry and Industry No. 47, 1488 (November 21, 1959)

Introduction. --A satisfactory method for determining the location and distribution of sulphate half-ester groups in polysaccharide sulphates is needed. Methylation of such materials is difficult to accomplish and seldom complete, consequently the results of analyses are ambiguous. The authors attempted to obtain a high yield of sulphated mono- and oligosaccharides from polysaccharide sulfates by partial degradation under conditions whereby the sulphate groups are not extensively cleaved. Partial degradation has been found possible in certain cases.

During the enzymic hydrolysis of some polysaccharides, the yield of oligosaccharides could be improved if the oligosaccharides were removed continuously from the reaction mixture by dialysis. A similar result could clearly be expected in the autohydrolysis of any polysaccharide that is sufficiently acidic and that contains relatively labile glycosidic linkages. Polysaccharides similar to kappa-carrageenin fill both both conditions. Most of the author's experience has been based on a polysaccharide obtained from the red alga Fulcellaria fastigiata. This polysaccharide contained 43.1 percent of residues of D-galactose, 30.3 percent of 3,6-anhydro-D-galactose, and 20.1 percent of the half-ester sulphate as SO_3Na.

Experimental. --Stir a 2-percent weight-for-volume aqueous solution of the sodium salt of the polysaccharide with an excess of a cation-exchange resin (Ion-X, H-form; 200 to 400 mesh) for 15 minutes at 60° C. and then filter. Dialyze the filtrate at pH 1.5 and 80° C. in a cellophane bag against a relatively large volume of water that contained barium carbonate in suspension.

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 ABSTRACTER: Martin Heerdt

SALT COD

HEATING OF FISH MEAL

VALUE OF CORN FERMENTATION SOLUBLES

SULPHATED SUGARS FROM ALGAL POLYSACCHARIDES

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temperature rise occurred so rapidly that it could not be ascribed to the growth of micro-organisms and must have been caused by chemical action.

Once the meal has absorbed moisture, conditions are ready for the growth of bacteria and molds. Microbial growth in dehydrated fish can occur if the moisture content exceeds 10 percent. Growth becomes dominant at a moisture content of 20 percent. The biochemical activities of micro-organisms cause a rise in temperature that may be of a much longer duration than the original heating. This temperature rise was found by Dreosti to occur after a time lag of 6 days. The occurrence of such a time lag is familiar to anyone having knowledge of microbial processes.

Causes of spontaneous heating.--Normal spontaneous heating that occurs immediately after fish meal has left the dryer can, with almost complete certainty, be ascribed to the oxidation of the fat or of a certain portion of the fat in the meal. This oxidation is exothermal; and heat is produced that, if not instantly and effectively removed, causes a temperature rise, which in turn leads to an acceleration of the oxidation process. Thus, in the center of a mass or stack of fish meal of suitable dimensions, very high temperatures can be reached.

Accidental spontaneous heating can be caused by delayed oxidation of the fat. Meal that is not sufficiently cured is meal in which the fat is not fully oxidized. Oxidation may take place suddenly in this meal during storage or transport. The immediate cause of the start of the oxidation reaction is often difficult to pin point, but the reaction could be started by a slight increase in temperature caused by some other factor. Heating that is caused by fat oxidation, whether normal or accidental, can, in extreme cases, lead to ignition. Proof is not available to show that ignition can eventually arise from microbial heating.

Measures to prevent spontaneous heating.--Producers of fish meal have developed certain practices for air cooling the meal immediately after it leaves the dryer to prevent spontaneous heating during storage.

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Results.--Analysis of both the dialyzate and the impermeate for half-ester sulphate showed that less than 20 percent of these groups had been removed as SO_4 ion. The authors separated the autohydrolyzate by preparative paper chromatography, using butan-1-acetic acid-water (50 : 12.25 volume-for-volume) as the solvent. The autohydrolyzate contained D-galactose, 3,6-anhydro-D-galactose, and 4-*O*-β-D-galactopyranosyl-3,6-anhydro-D-galactose (about 35 percent weight-for-weight) and at least five different sulphated mono- and oligosaccharides (about 60 percent weight-for-weight). Decomposition products of 3,6-anhydro-D-galactose were also present in the hydrolyzate.

Occasionally the yield of sulphated sugars could be improved by replacing the dialyzate with a fresh aqueous slurry of barium carbonate at hourly intervals. This system is clearly self-controlling; however, hydrolysis cannot proceed to completion unless a large excess of resin is included in the reaction mixture.

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(35.3 cu. ft.) and keep hold closed for 24 hrs. It is essential that the hold be damp. The active agent is H_2SO_3, which is formed when SO_2 combines with water vapor. If sulphur cannot be conveniently fired, the hold can also be washed with 4 percent solution of sodium or potassium metabisulphite, or 8 percent solution of sodium sulphite, or 0.5 percent solution of potassium permanganate;

4. After 24 hrs. open the hold and spray with slaked lime prepared by dissolving 10 kg. (22.4 lb.) of CaO in 100 l. (22 imp. gal.) of water.

The author recommends that, in order for the prevention of reddening to be successful, improvement in the quality of salt and in the techniques of curing, handling and storage of dried fish should also be ensured. Salt concentration in the flesh should not exceed 19 percent. Samples with reddening should be immediately separated from uncontaminated stock and washed with fresh water to lower the salt concentration to between 12 and 15 percent and in 2 percent sodium bisulphite solution to kill the halophiles. Wherever possible, the salted fish should be stored under refrigeration at 3° to 6° C. (37.4° to 42.8° F.)

The author makes references to the Canadian research on microbial control of red halophiles.

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(1956) with corn-fermentation condensed solubles. The removal of 2.5 percent condensed fish solubles and 2.5 percent dried whey product from the reference diet required an adjustment in the protein content of the altered ration to make it conform with that of the reference diet. Replacement of 2.5 percent condensed fish solubles and 2.5 percent dried whey product with 5 percent corn-fermentation condensed solubles did not require an adjustment in the protein content of the altered ration.

Day-old male White Vantress cross-bred chicks were used in the first study, whereas day-old male White Leghorn chicks were used in the other five studies. All chicks were housed in electrically heated battery brooders. Chicks in the first study received a preliminary diet for 7 days. At the end of this period, only the chicks nearest in weight to the median weight range were retained and used in a study that was continued for 21 days. Chicks used in the other five studies did not receive a preliminary ration; these studies were continued for 28 days. Eighteen chicks per lot were used in the first study, and 25 chicks per lot were used in each of the other five studies. Three replicates were used in the first study and four replicates in each of the other five studies.

Results.--In experiment I, removal of fish meal from the original starter ration caused a significant depression in weight gains and feed efficiency. The addition of 5 percent corn-fermentation condensed solubles to the fishless ration increased weight gains significantly above the fish-containing original ration. Feed efficiency was improved over the fishless ration, but it was poorer than in the original ration that contained 4.5 percent fish meal.

In experiment II, removal of condensed fish solubles and dried whey product from the A.N.R.C. Reference Chick Diet reduced weight gains and resulted in poorer feed efficiency. The use of corn-fermentation condensed solubles in place of the condensed fish solubles and dried whey product in the A.N.R.C. diet restored weight gains and feed efficiency to the performance level of the reference diet.

6.54 FISH FLOUR DEVELOPMENT

Anonymous
Trade News 12, 8 (October 1959)

Scientists of the Fisheries Research Board of Canada's technological station at Halifax have closed one chapter in their development of fish flour, but have removed the wraps from a new fish flour project that promises even greater potential than the original research experiment.

They have written "finis" to their successful experiments on "white fish"--cod and haddock--as a source of the high-protein fish byproduct, and have now started exploring the abundant stocks of herring and alewives as the raw material for a newer brand of fish flour.

The original project with cod and haddock was a singular success. Not only was the fish flour produced from cod and haddock offal at the Halifax station proven to be of a fine quality, but the Halifax product has another factor that was heretofore missing. The latter factor evolving from the last stage of the experiment involved a special treatment of the product that makes it easily miscible in liquids such as milk or water. One of the problems had been the difficulty in suspending fish flour in liquid, but the new treatment has cured that. There is now more uniform suspension and the fish product becomes as easily suspended in milk or water as does ordinary flour.

Capping off the fish flour experiment was the recent work which indicated that the product, which is roughly 90 percent protein, has a nutritive value equivalent to egg albumen, which is the standard used in nutritional assays.

The station's venture into the herring-alewives field as a source of fish flour has met with good

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Reprinted in whole

6.55 THE MANUFACTURE OF LIQUID FISH FROM TRAWLER TRASH

Robas, John S.
Fish Boat 5, 37, 39, 40, 54 (January 1960)

Of all the byproducts made from fish, liquid fish is the easiest to produce. You grind up the fish and let the fish digest themselves into liquid form, using their own stomach enzymes.

Enzymes are very complex organic compounds whose role can best be described as molecule-splitters: enzyme work on large, complex molecules of fish protein and break them down into smaller molecules or even into the individual amino acids that make up the protein molecules. In the process, the fish turns into a liquid.

The best way to investigate the production of liquid fish, which can be produced with very complicated equipment or by the simplest rigs, is through construction of a pilot plant. For example, a borrowed hamburger grinder with ¼- or ½-inch hole in the plate will be adequate for initial grinding trials. Take whole fish and grind them once; the finer the grind the quicker the bones will go into solution.

Before starting the grinder, rig up a "digester"; take a 55-gallon steel drum and cut out the top; cut a 1- or 2-inch hole about an inch above the bottom of the drum and braze in a pipe nipple. Then rig a small pump (a gear pump such as is used on shrimp trawlers is good) to the pipe nipple and connect the suction side of the pump to the nipple with a hose. A hose connected to the discharge side of the pump leading back into the drum completes the digester; it is simple to pump fish out the bottom and into the top, circulating the fish, speeding the reaction, and helping to digest the bones.

Approximately 400 pounds of fish are ground and the ground fish is acidified and placed in a

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ABSTRACTER: Kathryn L. Osterhaug

6.54 FISH FLOUR FOR HUMAN CONSUMPTION

Olden, June H. (U. S. Bureau of Commercial Fisheries, Seattle, Washington)
Commercial Fisheries Review 22, 12-18 (January 1960)

Introduction.--Economically underdeveloped countries have long needed an inexpensive source of animal protein for human consumption as a help in preventing malnutrition. The use of fish, dehydrated to prevent spoilage, offers a possible way of alleviating this deficiency. In the category of dehydrated fish is edible fish meal, or fish flour. Research programs therefore have been undertaken in several countries to produce a tasteless, odorless, white fish flour for use as a source of the required protein. In this review of the scientific literature on fish flour, the following topics are discussed: problems encountered in the use of fish flour, nutritional importance, acceptance tests, and processes of manufacture.

Problems encountered.--Some of the problems encountered in using fish flour as a protein supplement are preservation, consumer reaction, and cost. Since the keeping quality of fish flour depends primarily on the low oil content of the final product to prevent it from becoming rancid, one essential problem is to make a product that is low in oil. In countries where people object to a strong fish flavor, the flour must be refined, deodorized, or manufactured in such a manner that the final product is substantially flavorless. This constitutes another problem. The cost of producing fish flour for human food is high in contrast to that of producing fish meal for animal feed because of the palatability, sanitation, and aesthetic requirements of the consumer. Thus, the problem of cost must also be overcome.

Nutritional importance.--Analyses of bread made from enriched and unenriched brown flour and a comparison with daily requirement are shown in table 1 (see over).

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ABSTRACTER: June H. Olden

7.45 DETERMINATION OF TRACES OF CYANIDE IN FISH TISSUE

Marsden, K. (Freshwater Fisheries Laboratory, Pitlochry, Perthshire, England)
The Analyst 84, 746-747 (December 1959)

Cyanide can be recovered from poisoned fish tissue by steam-distilling the acidified tissue and collecting the distillate in sodium hydroxide solution. A disadvantage of this method is that the distillate may be turbid, particularly if the tissue is putrid. Interference from turbidity can be prevented by using the microdiffusion technique of Conway (1939). A high degree of sensitivity can be obtained by determining the recovered cyanide with a pyridine-pyrazolone reagent solution. Filaments excised from the gills of fish submitted for examination were found to be the most convenient material for analysis.

Reagents.--Reagents used were 0.1 N sodium hydroxide, 0.5 percent volume-for-volume acetic acid, 10 percent volume-for-volume sulfuric acid, 1 percent weight-for-volume chloramine T solution, and an aqueous pyridine-pyrazolone reagent solution prepared by dissolving 0.025 gram of bis-pyrazolone in 25 milliliters of pyridine and mixing the solution with 125 milliliters of a saturated aqueous solution of 1-phenyl-3-methyl-5-pyrazolone. The last reagent must be used within 25 hours after preparation.

Procedure.--Chop the gill filaments and homogenize a weighed portion of chopped filament with five times its weight of water in a laboratory homogenizer. Transfer 3 grams of homogenate to a Conway cell (size No. 1) that contains 2 milliliters of 0.1 N sodium hydroxide in the inner chamber. Acidify the homogenate with 1 milliliter of 10 percent volume-for-volume sulphuric acid that has been warmed to 30° C. Rock the unit to mix, and set aside for 3 hours to ensure complete diffusion. Transfer a 1-milliliter aliquot from the inner chamber to a 50-milliliter stoppered tube. Add 1.3

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ABSTRACTER: Martin Heerdt

FISH FLOUR IN CANADA

FISH FLOUR FOR HUMAN FOOD

MANUFACTURE OF LIQUID FISH

ASSAY FOR CYANIDE IN FISH

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Biological value of pilchard fish flour and pilchard meal is shown in table 2 (see below).

The nutritional aspects of fish flour are currently under study.

Table 1 - Analyses of Bread Made from Enriched and Unenriched Brown Flour and Comparison with Daily Requirement

Material and Requirement	Protein	Calcium	Phosphorus	Thiamine	Niacin	Riboflavin
	G. /100 g.	(Mg. /100 g.)				
Brown bread	9.0	50	160	0.3	2.0	0.13
Fish flour	80	7,000	4,500	0.13	5	0.22
2%-enriched brown bread	10.4	186	245	0.296	2.06	0.132
	G.	(Mg.)				
Daily requirement	70	800	900	1.5	15	1.8

Note: From Memorandum No. 89, Fishing Industry Research Institute, Cape Town, South Africa, 1958.

Acceptance tests.--Experiments on Consumer acceptance of fish flour have been conducted in a number of countries, including Chili, Thailand, and Mexico. The product is reported to meet consumer acceptance.

Processing.-- The basic process used in the manufacture of fish flour is solvent extraction, since this process is effective in removing oil.

Table 2 - Biological Value of Filchard Fish Flour and Filchard Meal

Material	Net Protein Utilization	True Digestibility	Biological Value
Pilchard meal, factory produced	61.6	86.8	71.0
Pilchard fish flour, prepared in laboratory	62.6	82.6	75.8

Note: From Eighth Annual Report of the Fishing Industry Research Institute, Cape Town, South Africa, 1955.

Food and Agriculture Organization and UNICEF, agencies of the United Nations, developed "Tentative Specifications for Solvent Extracted Fish Flour Defatted and Deodorized," dated June 12, 1957, which remain in effect, although they are still tentative.

Some of the countries producing fish flour are South Africa, Canada, Great Britain, France, and the United States. Closely allied products are manufactured in India, Germany, and Russia. The process varies somewhat from country to country. The author states that references listed in the appended bibliography should be consulted for details on actual manufacture. She points out that fish flour manufactured in the United States must meet the requirements of the U. S. Food and Drug Administration.

A stable, tasteless, odorless, nearly white, edible fish flour is reported to have been produced.

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milliliters of 0.5 percent volume-for-volume acetic acid to lower the pH to approximately 5.0, and adjust the volume to 15 milliliters with water. Add 0.2 milliliter of 1 percent weight-for-volume chloramine T solution, invert to mix, and then set aside for 1¼ minutes. Add 5 milliliters of pyridine-pyrazolone reagent solution, and again mix by inversion. After 30 minutes--the time required for optimum color development--dilute the contents of the tube to 50, 100, or 200 milliliters, depending on the color intensity. Measure the optical density in a 10-centimeter cell at 630 mμ with an absorptiometer. Determine the amount of cyanide present by referring to a previously prepared calibration graph. Carry out a reagent-blank test with each series of determinations. The blank value increases with the length of storage of the pyridine-pyrazolone reagent.

Results.--Recovery of added cyanide from healthy tissue ranged from 96.0 to 99.4 percent when measured amounts of a standard cyanide solution were added to a sample of homogenate prepared from the gills of healthy fish. The mean recovery was 97.7 percent, and the standard error 1.11 percent.

Discussion.--To determine the occurrence of cyanide poisoning in a river, the authors recommended that at least five fish--preferably found dead in the water and not on the bank--should be used. The concentration of cyanide in the gill filaments of 38 salmon that had not been poisoned ranged from 0.002 to 0.107 parts per million. These values showed a normal distribution on a logarithmic scale and a mean of 0.015 parts per million. Of 30 fish believed to have been poisoned, the gills of only three of the fish contained less than 0.067 parts per million of cyanide, with values ranging from 0.045 to 0.376 parts per million.

Salmon killed by exposure for 20 to 30 minutes to 4° F. water containing 50 parts per million of cyanide had about 2.5 parts per million of cyanide in the gills when analyzed 4 hours after death. This concentration decreased to about 0.5 parts per million in the gills of salmon that had been stored for 3 days at 20° C. Loss of cyanide can be reduced by refrigerating the tissues.

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results so far. While it is true that herring fish flour is not as white--it is slightly grayish--as the product made from cod and haddock, it is, for all practical purposes, tasteless and odorless.

Experiments so far also indicate excellent fish flour can be produced from alewives. Work is being carried on to measure the nutritional value of the new products. Analyses of the amino acid content of the new flours will be followed by nutritional assays made on rats.

Development of fish flour was a post-war project sponsored by the Food and Agriculture Organization of the United Nations. It was undertaken by many of the world's leading fishery research laboratories, including the station at Halifax. The program was prompted by a desire to supply underprivileged nations with a cheap supply of animal protein. There was another reason too, for emphasis on the work in countries on this side of the Atlantic. For instance, dietetic studies showed that in Canada and the United States there was need for additional proteins in some diet formulations, especially for people engaged in heavy manual work, post-operative patients and elderly people. One of the simplest uses of the product has been as an additive to bread and cereals.

Raw material for fish flour made from cod and haddock is the offal (trimmings from filleting tables, but not the heads) from the fish. In the case of herring and alewives the whole fish is used. From the latter species byproducts other than fish flour are also being developed.

Abundance of herring and alewives on the east coast of Canada gives the current experiment an added attraction. That is the economic feature which, in all probability, would make production of the flour cheaper than the "white fish" flour.

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barrel. Any liquid fish left over from a previous batch can be added to make the mixture easier to pump. In addition to slowing down bacterial decomposition, acidification serves another function. It dissolves the bones and some of the scales. Scales are especially difficult to dissolve and are enzyme resistant; one solution to the problem is to screen out the scales and give them a special treatment with acid, adding them later to the liquid fish solution.

Except in cold weather, the digester will need no artificial heat. In the South, exposure to the sun will run the temperature up very quickly. The fish should liquify in 6 to 8 hours. Once well liquified with most of the bones dissolved, the fish should be screened and put into storage, first checking the acidity to see that it is close to pH 5.0. As bones dissolve they use up acid and it is likely that more acid may have to be added as liquification proceeds. In a typical 55-gallon drum of fish, it can be expected that a small amount of bones and scales will be found after screening. Cover these with concentrated phosphoric acid, regrinding first if necessary; when dissolved add them to the liquid fish.

Liquid fish can be stored in any climate for months or even years without spoilage provided it is kept at an acid value of 5.0 or lower. The liquid fish manufactured as described above will average 23 percent solids and 77 percent liquids.

7.51 EVALUATION OF PROTEIN IN FOODS IV. A SIMPLIFIED CHEMICAL SCORE

McLaughlan, J. M.; Rogers, C. G.; Chapman, D. G.; and Campbell, J. A. (Department of National Health and Welfare, Ottawa, Canada)
Canadian Journal of Biochemistry and Physiology 37, 1293-1299 (November 1959)

Introduction.--The advantages of a simple screening procedure for protein evaluation are well recognized. Several workers have suggested the use of bacteria or protozoa in rapid screening tests, but these methods have been subject to criticism by Grau and Carroll (1958). Previous work in this laboratory showed that bacteriological methods gave erroneous results with many foods when compared with standardized Protein Efficiency Ratio values. Bacteriological methods did not allow for the methionine-cystine sparing relationships observed with rats; and consequently they were unsuitable for legumes and animal proteins.

Block and Mitchell (1946) showed that a close relationship existed between the chemical score and the nutritive value of proteins as judged by biological Protein Efficiency Ratio values. The chemical score was based on an estimate of the amino acid in maximum deficit when compared with whole egg protein after first establishing the relative concentrations of the ten critical amino acids in the proteins.

Recently, members of the Food and Agricultural Organization (1957) proposed that proteins be rated by comparison with a provisional mixture of pure amino acids the composition of which is based on the amino acid requirements of adult humans. This rating method places (1) less emphasis upon lysine than does the chemical score and (2) more emphasis upon tryptophan, which causes tryptophan rather than lysine to be considered the most deficient amino acid in some cereals. Evidence presently available indicates, however, that the nutritive value of cereals and cereal products may be predicted from their lysine content. In most practical foods, the growth-limiting amino acids

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 ABSTRACTER: Martin Heerdt

7.611 ASSAY OF VITAMIN A OILS. A REPORT ON THREE COLLABORATIVE EXPERIMENTS

Brunius, E. (National Institute of Public Health, Stockholm, Sweden)
Journal of the Association of Official Agricultural Chemists 42, 657-678 (November 1959)

Introduction.--In 1954, the Vitamin Assay Commission of the Food Division of the International Union of Pure and Applied Chemistry decided to develop a standardized method of vitamin A assay for the international trade in oils.

Experimental.--It was agreed that the factor for converting $E^{1\%}_{1\,cm.}$ 325 mμ (isopropanol) into I. U. vitamin per gram should be 1,830 and that oils should be considered in two categories according to their spectrophotometric characteristics. Measurements should be made on the unsaponifiable matter of oils isolated as directed in the U. S. Pharmacopeia; for Category 1 oils, most fish liver oils and vitamin A concentrates, correction according to the Morton-Stubbs principle should suffice; for Category 2 oils, whale liver oil and other oils having a high proportion of irrelevant material, the unsaponifiable matter should be chromatographed before the extinction is measured and the correction is applied.

To elucidate some analytical details of importance for the vitamin A assay, the Commission organized three collaborative experiments, which were performed in 1955, 1956, and 1957. The design and the outcome of these experiments are reported here.

Results.--The precision of spectrophotometric measurements was studied on a spectrophotometric standard containing phenylazo-p-cresol in isopropanol.

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 Author's summary

7.80 SOME TECHNIQUES FOR EVALUATING THE FLAVOR OF PROCESSED MEAT

Olson, L. Elmer; Greenwood, D. A.; Nielsen, H. M.; and Wilcox, E. B. (Utah Agricultural Experiment Station, Utah State University of Agriculture and Applied Science, Logan)
Food Research 24, 696-703 (November-December 1959)

The objectives of this investigation were to develop chemical techniques for evaluating the flavor of processed meat and to correlate these techniques with sensory evaluation tests.

Experimental.--Some of the meat products used in this study were: salted and unsalted beef luncheon meat (unprocessed), salted and unsalted beef luncheon meat (heat processed), salted lamb (unprocessed), salted lamb (heat processed), salted pork (unprocessed), salted pork (heat processed), beef and pork steaks, ham chunks, boned chicken and turkey, tuna and noodles with vegetables, beef stew, corned beef hash, and chopped ham and eggs.

Chemical analyses were made for dry matter, total nitrogen, hydrogen sulfide, and ammonia. Food acceptance was measured by a taste panel according to a hedonic scale method.

Results and discussion.--An increase in the length of the heat processing period for canned meat was accompanied by an increase in the concentration of hydrogen sulfide and ammonia in steam distillates of the canned meat. Steam distillates of the canned meats that received high food acceptance scores by the taste panel generally contained relatively low concentrations of hydrogen sulfide and ammonia. The desirable flavor of cooked meat appeared to be associated with low concentrations of volatile nitrogen and sulfur compounds.

The undesirable flavor found in some canned-meat products appeared to be associated with high

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 ABSTRACTER: Herman S. Groninger

7.89 ELECTROPHORETIC ANALYSIS OF FLUIDS OBTAINED FROM MECHANICALLY DISRUPTED AND FROZEN FISH MUSCLE

Seagran, Harry L. (U. S. Fish and Wildlife Service and the Alaska Fisheries Experimental Commission, Ketchikan, Alaska)
Food Research 24, 681-687 (November-December 1959)

Introduction.--When fish muscle is frozen and subsequently thawed, a cloudy, liquid phase called drip exudes from the muscle. The amount of drip and the rate at which it occurs in frozen fish are related not only to freezing and cold-storage conditions but also to differences between species of fish.

Seagran (1958) suggested that the denaturation of actomyosin (a fibrillar protein) by freezing and the resulting contraction of muscle fibrils, is at least partially responsible for the liberation of the intracellular sarcoplasm. Cell damage appears to be necessary for a release of the intracellular sarcoplasm regardless of any changes in the forces that stabilize the weakly structured sol of the sarcoplasm or the fibrillar proteins. If cell rupture affects but does not fundamentally cause the release of fluids from frozen fish, muscle fluids obtained by intentionally rupturing the tissue cells without freezing may be different from fluids obtained from frozen muscle.

The present study was made to compare the protein composition of fluids that could be obtained from mechanically disrupted fresh fish muscle with the protein composition of whole sarcoplasm and of drip from frozen fish muscle. This paper is a summary of an electrophoretic study of these fluids.

Materials.--All of the work reported in this paper was carried out on fluids prepared from the white muscular tissue of quillback rockfish (Sebastodes maliger). The whole fish were held for

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 ABSTRACTER: Martin Heerdt

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The average loss of vitamin A in the preparation of the unsaponifiable matter of a Vitamin A Reference Standard--containing all-trans vitamin A acetate in vegetable oil--is found to be 1.2 to 1.8 percent.

The correction formula derived for isopropanol is: E_{325} (Corr.) = $6.815E_{325} - 2.555E_{310} - 4.260E_{334}$. This formula cannot be applied to extinctions obtained with absolute ethanol as solvent because the respective extinction ratios underlying the correction formula differ significantly in isopropanol and absolute ethanol.

Activated alumina weakened by the addition of water was used for the chromatography. Two procedures for following the movement of the vitamin through the column were examined: (1) an antimony trichloride method consisting in the testing of aliquots of eluate with antimony trichloride solution, and (2) an ultraviolet method consisting in the observation of the column in ultraviolet light. When tested on the Vitamin A Reference Standard and samples of Category 2 oils, the two procedures were found to be equally efficient. After the chromatography the samples of Category 2 oils met the specifications for Category 1 oils. The average loss of vitamin A in the chromatography of the unsaponifiable matter of the vitamin A Reference Standard amounted to 2.4 to 2.5 percent, and the average total loss of vitamin A, that is, the loss in the isolation and the chromatography of the unsaponifiable matter, was 3.5 to 4.4 percent.

The inter-laboratory error at P = 0.95 for a duplicate assay was estimated at 6 to 8 percent for an oil in Category 1 and at 10 to 14 percent for an oil in Category 2.

The occurrence of positive corrections in vitamin A assays is discussed.

7.89 (Cross Reference: 3.239)

approximately 40 hours at 0° to 4° C., filleted, skinned, and a small amount of red, lateral tissue was removed prior to sample preparation.

Two types of tissue fluids were prepared from the fillets. Type one was obtained by extracting tissue directly with an equal volume of phosphate buffer of ionic strength 0.05 and pH 7.58 and then centrifuging the mixture. This fluid is referred to as an extract of low ionic strength. Type two was obtained by centrifuging 50 grams of a tissue for 60 minutes at 4,000 times gravity and 0° C. The latter fluid is referred to either as centrifuge liquor, if prepared from fresh fish muscle, or as centrifuge drip, if prepared from frozen fish muscle. The frozen samples were prepared by freezing both whole and mechanically disrupted fresh fillets--individually wrapped in aluminum foil and weighing approximately ¼-pound--directly on the plate of a contact-freezer at -29° C. in still air. These samples were held for 1½ to 2 months at -29° C. and then thawed overnight in still air at 0° C.

The volume of tissue fluid recovered from a given sample was measured in a graduated cylinder, and the protein concentration of the fluids was determined by the biuret method. Tissue fluids were dialyzed against phosphate buffer of ionic strength 0.05 and pH 7.58, centrifuged at 24,500 times gravity, and diluted to contain less than 4 milligrams nitrogen per milliliter of the final dialyzate prior to electrophoretic analysis. Electrophoresis was carried out in a Perkin-Elmer Apparatus, Model 38A.

Results.--Rupture of the cells of fresh tissues by mechanical means liberates a tissue fluid that contains the same number of protein components as are contained in drip obtained from frozen tissue and in extracts of low ionic strength (sarcoplasm) from fresh tissue. Differences were observed in the mobility characteristics for one protein component and in the relative contribution of this component to the total protein composition.

These differences were attributed to the degree to which the muscle cells were ruptured and to changes in the stability of the weakly structured sol of the sarcoplasm that were caused by freezing or manipulation.

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are lysine or methionine (+ cystine) or possibly, tryptophan.

In this paper, the authors show that a simplified chemical score, based upon the lysine, methionine, and cystine content of foods, correlates well with Protein Efficiency Ratio values obtained on the same foodstuffs.

Methods.--The procedure for the acid hydrolysis of proteins and the methods of assay for lysine and cystine have been described in part 3 of this series of papers. Leuconostoc mesenteroides P-60 (A.T.C.C. No. 8042) was used for the assay of methionine in 2-hour acid hydrolyzates by the method of Steele et al. (1949) using Difco methionine assay medium.

The method used for the determination of the Protein Efficiency Ratio values was that previously described by Chapman, Castillo, and Chapman (1959). Values were expressed as a percentage of the concentration of each amino acid in hydrolyzed egg protein. A simplified chemical score for a food was calculated as in the original method of Block and Mitchell (1946).

Results.--Based on the determination of these amino acids, a simplified chemical score was developed and compared with the Protein Efficiency Ratio values determined on the same samples. Each of 43 foods was assigned to one of two categories: (a) foods apparently deficient in lysine or (b) foods apparently deficient in methionine (+ cystine). With the 16 foods in the first group, a high degree of correlation was found between the lysine concentration and the Protein Efficiency Ratio values. With the 27 foods in the second group, a good correlation was found between the methionine (+ cystine) concentration and the Protein Efficiency Ratio values. Since the regression lines for the two groups were different, a factor was added to the methionine (+ cystine) values to simplify the relationship. The fact that foods deficient in lysine or in methionine (+ cystine) fell into two distinct groups appeared to be substantiated by data available in the literature. The simplified method, which yields reproducible results and correlates with animal assays, is recommended as a rapid screening procedure for the evaluation of protein in foods. It is not recommended as a replacement for the rat bioassay method.

7.80

values for hydrogen sulfide and ammonia in steam distillates of these products. Information was not obtained to show whether the undesirable flavor is directly related to the presence of these compounds or to some other compound not yet identified.

Mixed food products containing meat, vegetables, and cereal often give steam distillates that possess a flavor or odor of the nonmeat components as well as of the meat components. The concentration of hydrogen sulfide and ammonia in steam distillates from many mixed food products did not appear to be related to the mean food acceptance rating.

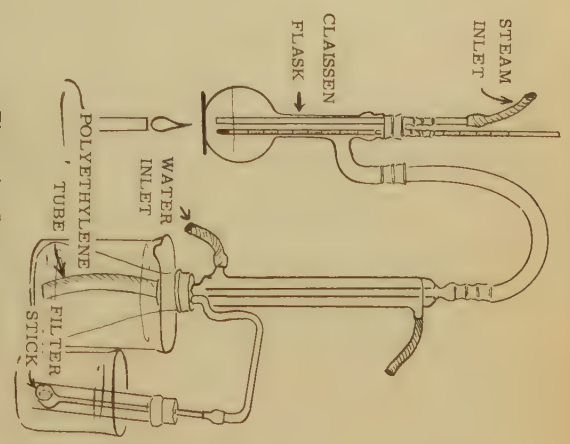

Figure 1.--Steam distillation apparatus

8.0 PROXIMATE ANALYSIS OF PACIFIC HERRING (CLUPEA PALLASII) AND AN EVALUATION OF TESTER'S "FAT FACTOR"

McBride, J. R.; MacLeod, R. A.; and Idler, D. R. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Journal of the Fisheries Research Board of Canada 16, 679-684 (October 1959)

Introduction.--Proximate analyses of herring have revealed marked differences in the fat and water content of various tissues depending on the time of the year when the herring are caught. Milroy (1906 and 1908) made the first careful study of this phenomenon and showed that the changes could be related to the feeding and spawning cycles of a given population of herring. These observations have been confirmed and extended by Johnstone (1914) and Lovern and Wood (1937). Bruce (1924) showed that at any given stage of sexual maturity the fat content of herring muscle was increased by age.

Seasonal changes in protein have been recorded by Lovern and Wood (1937). Changes in the proximate composition of Pacific herring (Clupea pallasii) during development are similar to those recorded for other species of herring caught elsewhere in the world according to Hart et al. (1940). Studies made by Tester (1940) showed reasonably good correlation between the oil content of the fish and an F value obtained by dividing the weight of a fish in air by its weight in water. His study was made in the course of an investigation of factors responsible for seasonal variations in the viscosity of condensed herring solubles.

Experimental.--Fresh herring were obtained at monthly intervals over a period of a year at a Vancouver, British Columbia, reduction plant from catches made by commercial herring boats off the southeast coast of Vancouver Island. Where possible, the herring were separated according to sex. Each group, which consisted of ten herring, was analyzed at monthly intervals. All of the

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 ABSTRACTER: Martin Heerdt

8.42 THE CARBONATE CONTENT OF SOME FISH AND SHELLFISH MEALS

Thurston, Claude E. and MacMaster, Patricia P. (Technological Laboratory, Bureau of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle 2, Washington)
Journal of the Association of Official Agricultural Chemists 42, 699-702 (November 1959)

Introduction.--Because of the natural carbonate content of fish meals and the consequent possibility that some processors may add limestone (calcium carbonate) as an adulterant, various state feed-control agencies have considered proposals to brand fish meals of high carbonate content as adulterated or to ban them from distribution. Since the natural carbonate content in fish meal varies with the raw material used, it is important to know the true range of values.

To provide a basis for estimating the range in carbonate content, the authors obtained 35 samples of meal manufactured from anchovy, herring, mackerel, menhaden, sardine, skipjack tuna, albacore tuna, and pink shrimp. The source of raw material and method of manufacture of all these samples were fully known to the authors. The purpose of this paper is to report the range of carbonate values obtained and to emphasize the need for caution in setting limits for carbonate content.

Samples.--The 35 samples of meal were obtained from 15 reduction plants located in British Columbia, Washington, Oregon, California, and Maryland. Six of the samples were composited from bulk lots that represented from one to several carloads of a given meal. Nine other samples were prepared in the laboratory pilot plant from press cake that had been transported to the laboratory under refrigeration. Most of the other samples were obtained by a staff member from the Seattle Technological Laboratory, who was present at the plant while the meal was being prepared.

Experimental.--The direct method of analysis for carbon dioxide described in Official Methods of Analysis, 8th Edition (1955), of the Association of Official Agricultural Chemists was used.

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 ABSTRACTER: Martin Heerdt

9.17 PREDICTION OF SELECTION FACTORS IN A TROPICAL TRAWL FISHERY

Longhurst, Alan R. (Fisheries Development and Research Unit, Freetown, Sierra Leone)
Nature 184, 1170 (October 10, 1959)

Introduction.--The discovery of a potential trawl fishery in an underdeveloped region may lead to the rapid expansion of a mechanized fishing fleet in that country and the exhaustion of the resource within a very few years. This has recently occurred in Liberia, and it also appears to be happening in Ghana. If it were possible, in the early stages of development, to introduce appropriate mesh-size regulations, the exploitation of the resources might be placed on a more rational basis.

Experimental.--As an interim measure, and as an alternative to legislation by intuition, the derivation of selection values (S) from the length to girth relationship of the fish appears to show promise. Ratios of the more important demersal fish off Sierra Leone have been investigated, and it is now possible to draw up a table of predicted values of S for these fish, based on the calculation $S = L/M$ in which L = 50 percent retention length and M = mesh size.

Results.--A considerable range in the values of S for these fish, as tabulated (see over), reflects the diversity of the commercial species and indicates the difficulty of reaching rational exploitation of such stocks. However, the author hopes that it will be possible to use these predictions to determine, to some extent, the effect of mesh size in the Sierra Leone trawl fishery.

Covered cod-end experiments have been started. These presumably will require several years for completion.

See table, over.

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 ABSTRACTER: Fredrick Wathne

9.4 THE TORRY RESEARCH STATION, ABERDEEN

Burgess, G. H. O.
Nature 184, 863-865 (September 19, 1959)

Introduction.--The Torry Research Station of the Department of Scientific and Industrial Research, Aberdeen, which was established in 1929--together with its substation, the Humber Laboratory, which was opened in Hull in 1952--conducts research on the problems of fish preservation.

Since many changes in techniques and organization of the fishing industry are forecast for the next decade, Torry is becoming increasingly occupied with the technical development of the industry of the future. In this article are discussed the types of research conducted by the Torry Station and the close cooperation prevalent between the Station and industry.

Applied research.--Since World War II, researchers at Torry have been tackling the problem of how to get fresher fish to the consumer. They have considered, as a promising solution, the design and use of trawlers capable of freezing the first third of the catch. A further development is the design of a vessel of normal size and cost that would be more economical than the existing high-speed trawler.

The use of antibiotics as a possible means of slowing down the rate of spoilage in fish is being studied. Among other problems, the amount of antibiotic likely to enter and remain in the flesh after it has been subjected to various types of storage, processing, and cooking needs to be determined.

The Humber Laboratory, in cooperation with the White Fish Authority, recently made a survey of the temperatures of fish during distribution from the time they were unloaded from the trawler to

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 ABSTRACTER: June H. Olden

ASSAY OF PACIFIC HERRING

CARBONATE IN FISH MEALS

TRAWL FISH CONSERVATION

TORRY RESEARCH STATION

8.42

Briefly, the method consisted of liberating the carbon dioxide from a weighed sample of meal by treating it with dilute hydrochloric acid in an alkalimeter. The values represent averages obtained from two to four analyses. All of the replicate analyses were in agreement.

Results.--The carbonate content of the fish meals prepared from the seven species of fish ranged from 0.28 to 1.68 percent and averaged 0.98 percent. The carbonate content of shrimp meal made from pink shrimp ranged from 5.3 to 27.1 percent. Samples prepared from the whole shrimp were lower in carbonate than were those prepared from peeler waste only. Meals prepared from peeler waste showed large variations in carbonate content owing to differences in the efficiency of removing the meats from the shell. Meals prepared from shrimp shells only were higher in carbonate than were those prepared from peeler waste. Variations in carbonate content depended on (1) the species used, (2) the parts of the specimen included, and (3) the method of drying the meal. Storage time would also be a factor if oxidation, mold formation, and change in moisture content were not prevented.

Conclusions.--The data on 35 authentic samples of known history indicate that carbonate values as high as 2 percent for fish meal and 25 percent for shrimp meal are reasonable. The carbonate content of mixed meals thus would depend on the relative proportions of fish and shellfish used. On the basis of the data obtained from a limited number of samples for one species of fish or shellfish, the authors were not able to set limits to the maximum content of carbonate to be expected in fish and shellfish meals. The data are nevertheless sufficient to show the need for caution in branding a fish meal as adulterated, especially if the meal is mixed. To establish adulteration, an agency would need a method other than simple analysis for carbonate, especially until more data are obtained on the natural variation of carbonate in fishery products so that reliable statistical limits can be set.

8.0

herring in a group were then pooled, ground in a meat grinder, and homogenized in a Waring Blendor. If analyses were not carried out immediately, the homogenate was frozen and maintained at -10° C. until used.

Moisture was determined by drying weighed samples to a constant weight in a Cenco moisture balance. Oil was determined by an improved method of analysis of the Association of Official Agricultural Chemists, 1945. Ashing was carried out in a muffle furnace at 550° C. Total nitrogen was determined by the macro-Kjeldahl procedure and expressed as protein by multiplying the value obtained by 6.25.

Results.-- The results reported are the average of analyses of the homogenates carried out in triplicate and are expressed as percent of the whole herring on a wet-weight basis. Oil levels in the herring reached their lowest values in March. The herring spawn between March and April. The oil level in April was nearly double that in March and remained high during May. In June, the fat content of the herring reached its peak and then declined, until spawning time the following year. A reciprocal relation between the water and the fat content of the herring did not exist. No significant differences between males and females were apparent.

No trends could be detected in the ash content of the herring that could be related to the time of the year. Protein levels were lowest in the fish during the months from April to August when the gonads could not be detected. Gonad development was accompanied by a gradual increase in the total nitrogen content of the herring, which reached its peak in January and February.

If the oil content of the herring and the corresponding F value of the herring were plotted against the month of the year, a superficial correlation between the two values was apparent. The average deviation from the true F value was 15.5 percent, and the range of deviation was 2 to 49 percent. Use of the F value as a practical means of determining the oil content of the herring is not recommended.

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the time they were sold from the fishmonger's slab. The survey has stimulated interest and is bringing about improved practices.

Basic research.--The Torry Station carries on a considerable volume of basic research. Greater understanding is being sought of the detailed structure and composition of fish tissues and of their behavior during processing such as freezing and cold storage, smoking, and drying. Knowledge is being acquired of the composition of the bacterial flora of fish and the nature of the species mainly responsible for spoilage. Studies have contributed to improvements in the taxonomy of the marine bacteria mainly concerned and to the building up of a type culture collection now of international reputation.

Progress in the characterization and estimation of the extractives of fish muscle is providing a clearer insight into the autolytic changes that take place immediately after death and during bacterial spoilage. Additional knowledge has been gained of the main proteins of fish muscle. Considerable attention has been given to the prevention of oxidative rancidity in cold-stored fatty fish. A new method has recently been devised for assessing the development of toughness in cold-stored fish.

Improved methods of thawing blocks of frozen fish are being sought. Recent experiments at Torry on the application of dielectric heating to the thawing of fish are proving successful. In 1939, a mechanical kiln for the commercial smoking of fish was developed at Torry that simplified the process and made it much easier to control. Intriguing possibilities are now being suggested as a result of basic physical and chemical work on the composition of wood smoke. The smoking of fish with "smokeless" smoke is envisaged, along with further developments. Torry has a continuous program on the improvement of the efficiency of the conventional fish-meal plant, emphasis being placed on methods of increasing production, plant efficiency, and the nutritive value of the product.

Cooperation between the Research Station and industry.-- The Torry Research Station enjoys its present high standing in the fishing industry largely because of the frequent consultations and discussions that take place between the Station and members of industry. Much of Torry's development and survey work of the past 10 years would have been impossible without the willing cooperation of industry. The future development of this relatively underdeveloped and traditional industry, which has no research organization of its own, depends on personal contact between government research workers and the industry.

9.17

Predicted S values for West African demersal fish, for a relatively flexible mesh of such material as cotton, manila, or nylon

Sheepfish (Drepane africana)	1.41
Spadefish (Ephippus lippei)	1.44
Catfish (Tachysurus gambensis)	1.91
Snapper (Pagrus ehrenbergi)	2.49
Crocus (Pristipoma jubelini)	2.89
Shinenose (Galeoides decatactylus)	3.30
Gwangwa (Pseudotolithus elongatus)	3.58
Ladyfish (Pseudotolithus senegalensis)	3.66
Whiting (Pseudotolithus senegalla)	3.71
Spanish (Polydactylus quadrifilis)	3.92
Tenny (Elops senegalensis)	4.22
Ladyfish (Pseudotolithus macrognathus)	4.26
Sole (Cynoglossus goreensis)	4.56

0.31 PHOSPHORYLATED INTERMEDIATES IN THE SYNTHESIS OF SQUALENE

Chaykin, S.; Law, J.; Phillips, A. H.; Tchen, T. T.; and Bloch, K. (Harvard Univ.)
Proc. Natl. Acad. Sci. U. S. 44, 998-1004 (1958)
Chemical Abstracts 53, 9305d (May 25, 1959)

0.31 EGG LIPIDS OF A SALMON, ONCORHYNCHUS KETA II. CONJUGATED LIPIDS FROM SALMON EGGS

Zama, Koichi; Katada, Mueno; and Igarashi, Hisanao
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 739-742 (1959) (English abstract)

Unfertilized salmon eggs and fertilized salmon eggs, 24 hours after fertilization, that had been treated with acetone were successively extracted with (1) ethanol, (2) petroleum ether, and (3) boiling ethanol to yield lecithins, cephalins, and sphingolipids. Properties of these lipids and component acids of lecithins indicated no marked difference between the corresponding lipid fractions of both eggs.

2.113 THERMAL AND OSMOTIC COUNTERMEASURES AGAINST SOME TYPICAL MARINE FOULING ORGANISMS

Fox, Denis L. (Scripps Institution of Oceanography, La Jolla, California) and Corcoran, Eugene F. (Marine Laboratory of the University of Miami, Coral Gables, Florida)
Corrosion 14, 31-32 (1958)
Contributions 1958, University of California, Scripps Institution of Oceanography, Contribution No. 988, pp. 197-198 (1959)

Tests were conducted to determine the tolerance of mussels of the genus Mytilus to immersion in fresh water at ambient temperatures and in sea water at elevated temperatures. It was found that young bay mussels, which constitute the most serious sedentary fouling organisms in local sea conduits, may be killed in about 50 minutes at 106° F., in an hour at 100° F., in 7 hours at 95° F., and within 14 hours at 90° F. They may survive for as long as 4 days at 82° F. and indefinitely at 77° F.

Test results indicate that it is impractical, in most cases, to apply fresh water as a lethal agent for the mussels in sea water conduits. A countermeasure found to be effective was the discharge of warm sea water through conduits.

2.1128 SHELLFISHING METHODS IN BRITANNY

Brandt, A. V.
World Fishing 6, 48-49 (April 1957)

(Abstract of this article appears under 2.1474 page 3 - August 1957)

2.1128 TESTING HYDRAULIC DREDGE FOR PACIFIC CLAMS

Anonymous
National Fisherman 40, 9, 27 (November 1959)

Chesapeake Bay dredging equipment could increase production for Washington (Puget Sound) clam-farming program.

2.1471 A NEW BRACED BAG

Jaudzims, J.
Deutsche Fischerei Zeitung 5, No. 7, p. 211 (July 1958) (In German)
World Fisheries Abstracts 10, 13-14 (May-June 1959)

Large fyke nets are unsuitable because the wooden rings are heavy. A large braced bag has been designed that is kept open not by wooden rods or rings, but by means of four lines. These lines are fastened to two rods at the entry of the fyke net and to an iron ring at the cod end. This makes a trap with a square or rectangular cross section (see fig.). Work with such nets of 1.4 to 4 m. (4.6 to 13 ft.) in height proved timesaving and profitable.

2.1471 OTTER TRAWLS ON THE PACIFIC COAST

Scofield, W. L. (California Department of Natural Resources)
National Fisherman 40, 11, 24-25 (March 1959)

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
Thread		Clupea pallasii (Pacific)
		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		Callinectes sapidus
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Cancer magister
Dungeness		Paralithodes camtschatica
King	Alaska king crab	Cancer irroratus (New England)
Rock		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and
		Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)

Common name	Other common names	Scientific name
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
Ocean quahog		Venus mortoni (Florida)
Pismo		Cyprina islandica
		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
Sea		Pecten aequisulcatus (Pacific)
		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

3.12 USE OF AUREOMYCIN-ICE FOR THE PRESERVATION OF SQUID

Oshima, Kokichi (Hokkaido-ku-Suiken, Yoichi)
Hokusuishi Geppo 16, 106-17 (1959)
Chemical Abstracts 53, 14376d (August 10, 1959)

3.12 THE PENETRATION OF CHLORTETRACYCLINE INTO TISSUES OF SOCKEYE SALMON ON CTC-DIP TREATMENT AND ITS DESTRUCTION ON HEATING

Tomiyama, Tetuo; Yone, Yasuo; and Kobayashi, Kunio
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 12, 1012-1018 (1959) (English abstract, table, and figures)

Sockeye salmon were caught by gill net, received aboard a factoryship, dipped for 30 minutes in a solution of 10 p.p.m. chlortetracycline in sea water, frozen, and held at about -20° C. The skin, the operculum, the fin, and the gills were found to contain a large amount of CTC, whereas the flesh contained less than 0.13 p.p.m. and the gut contained less than 0.01 p.p.m. of CTC. No penetration of CTC occurred in flesh deeper than 3 to 4 mm. under the skin.

3.3344 STUDIES ON THE "BROWNING" OF CANNED CRAB MEAT IV. SOAKING OF THE RAW MATERIAL IN WATER AND HEATING

Nagasawa, Yoshio (Faculty of Fisheries, Hokkaido University)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 12, 971-975 (1959) (In English)

Crab meat that had been soaked and washed in water to extract and remove amino acids and reducing sugars prior to canning showed less browning of the canned product than did untreated crabmeat. Temporary preservation of the boiled meat in ice water also was effective. In the practical processing of canned crab, browning may occur if the product is heat processed at 110° C. for 85 minutes.

V. "Browning" in different body parts of raw crab.--Ibid. 976-977. The degree of the "browning" of the claw meat was distinctly greater than that of the other meats, whereas no visible difference was apparent between the browning of the shoulder meat and of the leg meat. Claw meat was somewhat peculiar as compared with other meats in that the amounts of volatile basic nitrogen, total nitrogen, amino nitrogen, and reducing sugars were larger than those of the other meat. When the pH value of meat is over 6.5, browning increases as the pH value increases.

3.63 DRYING METHODS AND EQUIPMENT IN VACUUM

Anonymous
The Fishing News No. 2208, 1-12 (August 1955)
World Fisheries Abstracts 7, 37-38 (March-April 1956)

3.63 ON THE PREPARATION OF REVERSIBLY DRIED FISH MEAT

Takei, Makoto and Takahashi, Toyo-o
Bulletin of Tokai Regional Fisheries Research Laboratory, No. 14, 91-97 (September 1956) (English abstract)

Dried fish meat that contains only a small quantity of fat absorbs water much more readily than dried fish meat that is rich in fat. After immersing dried meat that had been treated for 15 hours before drying with 0.05 percent betahydroxyanisole solution containing 2 percent sodium citrate or 1 percent dibasic sodium phosphate, the water content of the dried meat was greater than that of raw meat in many cases.

4.13 THE COMPONENT ACIDS OF INDIAN FISH (CATLA BUCHANANI) FAT

Pathak, S. P. and Dey, L. M. (Hindu Univ. Banaras)
J. Proc. Oil Technologists' Assoc., India, Kanpur 12, No. 11, 103-7 (1958)
Chemical Abstracts 53, 11670g (June 25, 1959)

The chemical compound of the fatty acids derived from C. buchanani is reported. More than 50 percent of the acids were unsaturated, the C_{16}, C_{18}, C_{20} acids predominating. Myristic, palmitic, stearic, and arachidic acids were present to the extent of 2.8, 20.6, 7.6, and 0.3 percent, respectively.

4.13 STUDIES ON THE LIPID OF PLANKTON--II. FATTY ACID COMPOSITION OF LIPIDS FROM EUPHAUSIACEA COLLECTED IN THE ANTARCTIC AND NORTHERN PACIFIC OCEANS

Saiki, Masamichi; Fang, Shin-chen; and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 10, 837-839 (1959) (English abstract and tables)

Euphausia superba from the Antarctic Ocean and Euphausia pacifica combined with small amounts of Thysanoessa inermis and Thysanoessa longites from the Northern Pacific Ocean were obtained from the stomach of fin whales and extracted with alcohol, acetone, and ether. Reddish brown lipids were obtained. Euphausia superba assayed 28.2 percent saturated acids (palmitic 14.4 percent, myristic 11.9 percent and a trace of stearic and lauric) and 71.8 percent unsaturated acids (C_{18} 34.7 percent, C_{16} 18.6 percent, $> C_{20}$ 13.6 percent, C_{14} 4.5 percent, and a trace of C_{12}). The euphausia mixture from the North Pacific Ocean assayed 16.1 percent saturated acids (palmitic 13.8 percent and a trace of stearic and myristic) and 83.9 percent unsaturated acids (C_{18} 52.8 percent, $> C_{20}$ 15.5 percent, C_{16} 8.6 percent, and C_{14} 7.0 percent).

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
ASHRAE Journal (formerly Refrigerating Engineering)
Biochemical Journal
Biochemistry (U.S.S.R.)
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmestic Industry
Federation Proceedings
Feed Bag
Feedstuffs
Fish Boat
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish.Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

4.20 PREPARATION OF QUATERNARY AMMONIUM SALTS FROM FISH OIL AND THEIR ANTIBIOTIC ACTION

Toyomizy, Masamichi; Enomoto, Noriyuki; and Tomiyasu, Yukio
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 743-748 (1959) (English abstract and tables)

Triethylammonium bromide prepared from sardine oil inhibits the growth of fungi, except Rhyzopus japonicus, at 1 : 310,000 and that of yeasts and bacteria--except Pseudomonas fluorescens, Proteus vulgaris, and Escherichi coli--at 1 : 1,600,000. The activity of unsaturated quaternary ammonium bromides is affected by the length of the carbon chain and by the degree of unsaturation in the long carbon chain, whereas the activity of saturated compounds is influenced only by the carbon chain length. Lengthening the carbon chain beyond C_{16} weakens the activity, whereas an increase in unsaturation enhances it.

4.20 PRESENT KNOWLEDGE ABOUT THE ALTERATION OF FATS

Wolff, J. P. (ITERG, Paris)
Rev. franc. corps gras 6, 275-88 (1959)
Chemical Abstracts 53, 16560g (September 10, 1959)

6.237 CONCENTRATION OF VITAMIN A OIL BY USE OF ALUMINOSILICATES

Funaki, Koemon; Inoue, Keijiro; and Inagaki, Makoto
Japan. 9084 (Oct. 24, 1957)
Chemical Abstracts 52, 14101 (August 25, 1958)

6.237 STUDIES ON THE ECONOMICAL MANUFACTURE OF VITAMIN A CONCENTRATE FROM FISH LIVER OIL--VIII. CHROMATOGRAPHICAL SEPARATION OF VITAMIN CONCENTRATES

Shimma, Yaichiro and Tanaka, Minoru
Bulletin of the Japanese Society of Scientific Fisheries 25, No. 1, 52-58 (1959) (English abstract, figure, and tables)

Chromatography was used in a study of fish-liver oil concentrates. Molecular distillation successfully removed nonvitamin materials with conjugated double bonds. Nonvitamin materials without conjugated double bonds were not removed.

IX. Purification of vitamin A concentrate with methanol.--Ibid. 59-66. Aqueous methanol applied under specific conditions has been successful in eliminating both fishy smell and hydrocarbons from vitamin A concentrate. The color of the refined concentrate also was improved to some extent. The method may be recommended for refining vitamin A concentrate industrially at reduced cost.

6.29 THE CONSTITUENTS OF COD LIVER WITH VITAMIN B_{12} ACTIVITY FOR LACTOBACILLUS LEICHMANNII

Truscott, Beryl and Hoogland, P. L.
Canadian Journal of Biochemistry and Physiology 34, 191-196 (1956)
Studies 1956 from the Stations of the Fisheries Research Board of Canada, FRB No. 428, 6 pp. (1957) (Ottawa)

The identity of the compounds that together form the total microbiological vitamin B_{12} activity of cod-liver residue was determined by a fractionation procedure involving ion exchange, countercurrent distribution, partition chromatography, and microbiological assay. The presence of cyanocobalamin, hydroxocobalamin, and the desoxyribosides of thymine, uracil, hypoxanthine, xanthine, and guanine was demonstrated. The total vitamin B_{12} activity, as determined by microbiological assay with Lactobacillus leichmannii, and its distribution in cod-liver residue, were very similar to those of beef liver.

6.29 EFFECT OF FEEDING COD-LIVER OIL AND UNSATURATED FATTY ACIDS ON RUMEN VOLATILE FATTY ACIDS AND MILK FAT CONTENT

Shaw, J. C. and Ensor, W. L. (Univ. of Maryland, College Park)
Chemical Abstracts 53, 20344e (November 10, 1959)

6.32 ENZYME SYSTEMS IN MARINE ALGAE 3. TRANS-β-GLUCOSYLATION BY EXTRACTS OF CLADOPHORA RUPESTRIS AND ULVA LACTUCA

Duncan, W. A. M.; Manners, D. J.; and Thompson, J. L. (Department of Chemistry, University of Edinburgh, Scotland)
Biochemical Journal 73, 295-298 (October 1959)

Extracts of Cladophora rupestris and Ulva lactuca catalyze the synthesis of oligosaccharides from concentrated solutions of cellobiose. Laminaribiose, gentiobiose and cellotriose have been identified by paper chromatography.

6.32 CHEMICAL STUDIES ON THE VOLATILE CONSTITUENTS OF SEAWEED XIV. ON THE VOLATILE CONSTITUENTS OF LAMINARIA SP. (2)

Katayama, Teruhisa (Hiroshima University)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 11, 925-932 (1959) (In English)

A fraction soluble in sodium hydrogen carbonate was submitted to silica gel column chromatography, with methanol as the stationary phase and iso-octane as the mobile phase under a pressure of nitrogen gas. The fatty acids present in each fraction were characterized as their p-bromphenacylesters, and the presence of acetic, propionic, butyric, isovaleric, n-caproic, and caprylic acids was confirmed.

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7.51 A NEW TECHNIQUE FOR THE MEASUREMENT OF TEXTURE CHANGES IN FISH MUSCLE, AND ITS APPLICATION IN ASSESSING THE QUALITY OF COLD-STORED MATERIAL

Love, R. M. (D.S.I.R., Torry Research Station, Aberdeen, Scotland)
Bulletin de L'Institut International du Froid, 10th International Congress of Refrigeration (Paris) 39, 868 (1959)

The present paper describes a new method for measuring cold-storage deterioration in fish. The method is based on a collective measurement of the fragility of individual muscle cells. Results obtained so far show far less scatter when plotted against storage time than do the corresponding values for soluble protein. The method is quick and easy to perform. Only 0.2 gram of muscle is required for each determination.

7.51 CHEMICAL STUDIES ON THE RED MUSCLE ("CHAI") OF FISHES--X. A NEW METHOD FOR DETERMINATION OF MYOGLOBIN

Matsuura, Fumio and Hashimoto, Kanehisa
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 10, 809-815 (1959) (English abstract, tables, and figures)

A new method for the determination of fish myoglobin was offered that is based on a difference in heat coagulability between Mb and hemoglobin.

7.593 THE PAPER-CHROMATOGRAPHIC DISTRIBUTION OF PROTAMINES

Goppold-Krekels, A. and Lehmann, H. (Univ. Frankfurt, Ger.)
Chemical Abstracts 53, 15187C (August 25, 1959)

7.593 DETERMINATION OF VOLATILE COMPONENTS OF FOODSTUFFS. TECHNIQUES AND THEIR APPLICATION TO STUDIES OF IRRADIATED BEEF

Merritt, Charles, Jr.; Bresnick, S. R.; Bazinet, M. L.; Walsh, J. T.; and Angelini, Pio
Journal of Agricultural and Food Chemistry 7, 784-787 (November 1959)

Techniques have been developed for the isolation, separation, and identification of volatile components of various foodstuffs such as meat, fish, vegetables, and coffee. Isolation and separation are accomplished by low-temperature, high-vacuum distillation techniques and by gas chromatography. Three main fractions are usually obtained by the low-temperature, high-vacuum technique: a carbon dioxide fraction, a center cut, and a water fraction. Further separation is required before final identification of the components by mass spectrometry can be made. The efficiency and advantages of the different separation techniques are discussed. Some results of studies of the volatile components isolated from samples of irradiated beef are given.

7.80 STUDIES ON MUSCLE OF AQUATIC ANIMALS XXXIX. CHANGES IN MUSCLE OF YELLOWTAIL (SERIOLA QUINQUERADIATA) DURING COLD STORAGE

Simidu, Usio; Terashima, Hiroyoshi; and Simidu, Wataru (Department of Fisheries, Kyoto University, Maizuru)
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 586-590 (1958) (In English)

Taste panel methods were used to determine the effect of storage upon the flavor of yellowtail fillets. Amounts of volatile basic nitrogen, histidine, other free amino acids, soluble protein nitrogen, and acid soluble organic phosphates were employed as chemical criteria for the changes.

7.80 METHOD FOR THE EVALUATION OF FRESHNESS FISH-PUDDING CONTAINING STARCH

Higasa, Shichiro and Asakawa, Suezo (Nankai-ku Suiken, Kochi)
Chemical Abstracts 52, 15775 (September 25, 1958)

7.80 EVALUATION OF EDIBILITY OF SOME SEA TELEOSTS

Lambruto, G. (Univ. Messina, Sicily)
Chemical Abstracts 53, 2502d (February 10, 1959)

8.51 CHANGES IN AMINO ACID COMPOSITION OF PROTEIN DURING THE MATURATION OF RAINBOW TROUT EGGS

Suyama, Michizo; Kaneko, Mitsunori; and Omata, Hideo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 660-662 (1958) (English abstract and table)

Alanine, cystine, leucine, lysine, phenylalanine, proline, and valine were found to increase with maturation; whereas aspartic acid, glycine, histidine, and threonine tended to decrease. The amount of protein seemed to increase during maturation, while maintaining almost the same composition of amino acids.

8.51 STUDIES ON THE ORGANIC PHOSPHATE IN MUSCLE OF AQUATIC ANIMALS VI. EFFECTS OF STORING TEMPERATURE UPON THE CONTENT OF MUSCULAR NUCLEOTIDES OF SQUID

Saito, Tsuneyuki; Arai, Kenichi; and Tanaka, Tsune
Bulletin of the Faculty of Fisheries, Hokkaido University 9, 121-126 (August 1958) (English abstract)

Values of ATP for fresh muscle of squid (μmole/g. muscle wet wt.) were 5.5~8.3. ATP was the main component of acid soluble nucleotides. During the cold storage at -6°C. there was a rapid splitting of ATP accompanying the formation of AMP, which was converted to inosine and then to hypoxanthine. When fresh muscle was held at 17°C., the changes occurred more rapidly than those observed at -6°C.; and as a result, a large amount of hypoxanthine was accumulated.

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